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BIPINNATE LEGUMINOSAE OF NICARAGUA

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This is the article which I wish someone else had written before me so that I might have used it in identifying my specimens from Nicaragua.

Since the Leguminosae are classified largely by flowering characters such as the number of stamens and the regularity or irregularity of the corolla, it is natural that such characters are used largely in keys for identification. When, however, one has a specimen in fruit, he is under the necessity of wading through a host of descriptions and then hunting for a number of scattered sources to make sure that some recent species has not been overlooked. Not only to report the species found in Nicaragua by my companions and myself, but to gather together scattered information from these sources and to organize it in the form best adapted to fruiting specimens is the purpose of this article. It is hoped to save others the time-consuming process just described.

In view of possible extensions of range, species of Central America are included which at present are not known to occur in Nicaragua.

Such a project meets with special problems. First, in this group, more than in most families, characters frequently cross generic lines. This aspect is enlarged upon by the authors of the Flora of Panama (Ann. Mo. Bot. Garden 37: 226. 1950). Two species of the same genus may differ more than two species of different genera. Mimosa albida Humboldt & Bonpland can easily be mistaken for a Pithecellobium. Acacia pennatula (Schlechtendal & Chamisso) Benth can easily be confused with Lysiloma multifoliolatum Britton & Rose. In view of this situation, it is advisable for practical purposes to construct one composite key making use of vegetative characters in identifications.

Secondly, in no less than 13 species of bipinnate legumes of Central America, fruit is unknown. Perhaps no one would ever look for such species in a key for fruiting specimens. Yet they ought not to be omitted. In some cases they can be identified by the following key. The limitation of the use of characters by species in which fruit is unknown has some compensation in the

fact that vegetative characters are very useful and in some cases help to identify sterile specimens.

The species of bipinnate legumes for which fruit is unknown are an intriguing subject for investigation and study. It may be that they are sterile hybrids. Maybe they will never fruit. But that is a rash statement; anything can happen. Plants which are apparently sterile may be fertile under some circumstances. It may be that a specimen in fruit will be collected sometime. Does Celastrus scandens L. suggest a parallel? In New England, it often occurs in sterile condition in areas where a fruiting specimen has rarely or never been collected. This appears to be the case in the fringes of its range. This is my personal observation. It may be that in the fringes of its range weather conditions are only rarely favorable to its fruiting. That weather, such as a late frost, does affect fruiting is well known to fruit-growers.

Another parallel is suggested by Podocarpus sp. which is commonly cultivated in Florida. Plants of this species growing on my own property in Gainesville, for instance, have blossomed and fruited in only one of the seven years during which I have watched them. Since every year the weather differs from every other year, it may be that a season favorable to fruiting occurs only rarely.

Alpinia sp., likewise growing on my own property, has done the same thing. In just one year of the seven during which I have observed it, it has blossomed. The two species did not blossom in the same year. Can similar causes be operating in the bipinnate legumes in Nicaragua for which no fruit is known? Was no collector present to get specimens during the year in which they fruited? Can some of these plants be slipped and grown under controlled conditions so that the effect of weather and other possible factors can be observed?

Of the three subfamilies of Leguminosae, in a broad sense, two include bipinnate species; such species are not known in the Papilionoideae. Subfamily Mimosoideae consists largely of bipinnate species. Exceptions are Inga, a large genus in which almost all species have simply pinnate leaves; and in Pithecellobium 3 species have once-pinnate leaves, namely, P. membranaceum (Bentham) Schery, P. rufescens (Bentham) Pittier and P. tubuliferum Pittier. While most species of Acacia have bipinnate leaves, in A. neriifolia M. Cunn. leaves are reduced to phyllodia, that is, reduced to petioles so that they appear to be undivided.

Subfamily Caesalpinoideae is represented in Central America by only 5 genera with bipinnate leaves, namely, Caesalpinia, Delonix, Parkinsonia, Peltophorum and Schizolobium. Cerci-

dium does not surely occur. Haematoxylon has species with bipinnate leaves, but the species which occur in Central America are once pinnate.

I wish to express my thanks to the following persons for various kinds of assistance in preparing this article. Dr. Reed C. Rollins, then Director of the Gray Herbarium and Dr. Richard A. Howard, then Director of the Arnold Arboretum, for the privilege of studying and examining thousands of specimens in their respective institutions. Mr. Ray Angelo for examining specimens in the Harvard Herbaria and sending me information. Dr. Lyman B. Smith and Dr. David B. Lellinger, by whose courtesy I have been enabled to make use of the facilities and examine specimens in the United States National Herbarium. Miss Melissa P. Marshall who assisted me in citing specimens in the Harvard Herbaria. Mr. John T. Atwood, Jr., for citations from the Herbarium of the Michigan State University and the Florida State University. Dr. Silvio Echavery B., Director of the Escuela Nacional de Agricultura y Ganaderia in Managua who has provided hospitality to my companions and me while collecting and preparing specimens and with whom a set of specimens has been deposited. Dr. Jaime Incer and Mr. David A. Neill who made the facilities of the Universidad Centroamericana in Managua available to my companions and me for pressing and preparing specimens, with whom likewise a set of specimens has been deposited. Dr. Daniel B. Ward and Dr. Walter Judd and the staff of the Herbarium of the University of Florida. A set of specimens collected while using their facilities has been deposited with the University of Florida. Miss Sue Heine, the artist who drew the excellent illustrations for this article. Dr. L. C. Anderson, Director of the Herbarium of the Florida State University for the loan of specimens.

ARTIFICIAL KEY TO BIPINNATE LEGUMINOSAE OF NICARAGUA AND OTHER CENTRAL AMERICAN COUNTRIES

The long vertical line in the left margin indicates species with one pair of pinnae on a leaf.

- A. Legume jointed, usually flat; joints separating in maturity, sometimes leaving persistent margins B.
- B. Legume 4-15 mm wide; see p.25 for key
- many species of Mimosa
- B. Legume 20-100 mm (2 -10 cm) wide; woody vine C.

- C. Legume 2-2.5 cm wide; leaflets 3-6 pairs on a pinna, 1-5 cm long; twigs, petioles and axis of leaves with dense recurved prickles; p. 4) . Entada patens (Hook. & Arn.) Stan.
- C. Legume 5-10 cm wide; stem and leaves without prickles D.
- D. Leaflets 3-6 pairs, usually 4-5 pairs; legume very large 1-2 m long, 8-10 cm wide; leaves often with tendrils; p. 40 Entada gigas (L.) Fawcett & Rendle
- D. Leaflets (5-)6-8 pairs; legume 20-40 cm long, 5-8 cm wide; leaves seldom with tendrils; p. 40, illustr. 62 Entada polystachya (L.) DC.
- A. Legume not jointed or unknown E.
- E. Pinnae 2 (1 pair), no more on any leaf F.
- F. Spines at nodes only, usually in pairs G.
- G. Leaflets 0.4-1.8 cm long; legume gradually narrowed to base (attenuate); petiole 4-10 mm long, without glands H.
- H. Leaflets 8-18 mm long, 3 mm wide; legume up to 14 cm long, 10 mm wide, pubescent when young; p. 38 Calliandra Magdalenae (Bert.) Bth.
- H. Leaflets 4-6 mm long, acute or obtuse I.
- I. Legume glabrous, 6-8 mm long, 7-8 mm wide; leaflets 5-6 mm long, about 1 mm wide; p. 36 Calliandra Caeciliae Harms
- I. Legume densely villous; leaflets 4-6 mm long; p. 39 Calliandra Wendlandii Bth.
- G. Leaflets 2-13 cm long, glabrous above J.
- J. Leaflets 4-5 cm wide, 8-11 cm long, glabrous, acuminate; veins reticulate; p. 49 Pithecellobium hondurense B. & R.
- J. Leaflets 1.5-2.5 cm wide K.
- K. Leaflets hairy above and beneath; petiole 1.5-2.5 cm long, densely hirtellous; leaflets 2.5-4.5 cm long, 1.5-2.5 cm wide; flowers in spikes; legume unknown; p. 52 . . Pithecellobium saxosum St. & St.
- K. Leaflets glabrous or nearly so above, sometimes hairy in axils of veins beneath, otherwise glabrous L.
- L. Legume tomentose; leaflets 6-13 cm long, 2-5 cm wide, some of them gradually narrowed to acute tip; veins not conspicuous beneath; legume compressed; seeds black; p. 49 Pithecellobium hymenaefolium (H. & B.) Bth.
- L. Legume glabrous or nearly so, or hairy, not tomentose M.

- M. Legume terete or almost terete, almost straight to much curved or coiled; leaflets 2-7 cm long N.
- N. Leaflets hirsute beneath, at least on veins; veins raised, conspicuous beneath; twigs hirsute; leaflets 3-7 cm long; flowers in head-like spikes; p. 50 . . .
 Pithecellobium Johansenii Stan.
- N. Leaflets glabrous or nearly so; legume straight or curved, glabrous; seeds black; flowers in spikes; spines at nodes O.
- O. Legume 8-12 cm long, 1 cm wide, almost straight or curved, glabrous, indented or depressed between seeds; leaflets 2-7 cm long; p. 50, illustr. 62 . . . Pithecellobium lanceolatum (H. & B.) Stan.
- O. Legume 6-8 cm long, 1.5-2 cm thick; veins not raised; leaflets 3-7 cm long; p. 50, 51
 Pithecellobium pachypus Pittier
- M. Legume compressed; flowers are needed to distinguish the 4 species immediately following P.
- P. Flowers in spikes Q.
- Q. Gland of petiole columnar; twigs puberulent or hirtellous or nearly glabrous; legume nearly glabrous, on short stipe, 1 cm wide; peduncles usually 1-3 cm long; leaflets 6 cm long; p. 51
 Pithecellobium oblongum Bth.
- Q. Gland of petiole small, not columnar; twigs puberulent or glabrate; legume glabrous or nearly so, 1.5-2 cm wide; leaflets 3-12 cm long; p. 49 . . .
 Pithecellobium insigne Miceli
- P. Flowers in heads; twigs glabrous or nearly so; gland of petiole circular, at summit; legume 8-15 mm wide; peduncle less than 2 cm long; leaflets 3-7 cm long R.
- R. Leaflets with texture of writing paper (chartaceous); spines at nodes; p. 48, illustr. 60
 Pithecellobium dulce (Roxb.) Bth.
- R. Leaflets leathery (coriaceous); spines at nodes or sometimes lacking; p. 50
 Pithecellobium keyense Britton
- F. Spines none S. cp. p. 4
- S. Legume much curved, 8-15 mm wide T.
- T. Legume 8-10 mm wide, much curved; leaflets 3 or 4 rarely 2 on a pinna, 4-9 cm long; petiole short or almost none; legume not narrowed between seeds; p. 51, 52 Pithecellobium Recordii (B. & R.) Stan.

- T. Legume 12-15 mm wide, much curved almost into a circle, narrowed between seeds; leaflets 4-6 on a pinna (2-3 pairs), glabrous; lower leaflets slightly smaller than terminal ones; terminal leaflets 5-15 cm long; p. 52 Pithecellobium racemiflorum D. S.
- S. Legume straight or slightly curved or unknown U.
- U. Terminal leaflets 9-20 cm long, 3-7.5 cm wide, much larger than basal pair; petiole up to 6 cm long V.
- V. Young twigs with reddish hairs, later glabrate; petiole less than 6 cm long; glands on axis of leaves between each pair of pinnae; peduncles 2-24 cm long; legume narrowed between seeds; valves twisted when open W.
- W. Leaflets 2-5 (usually 3) pairs on a pinna, acuminate, glabrous; petiole less than 1 cm long; legume about 10 cm long; gland between terminal pair of pinnae; peduncles up to 7 cm long, usually 2-3 cm long; p. 53 Pithecellobium Valerioi (B. & R.) Stan.
- W. Leaflets 4-6 pairs on a pinna; petiole 2-6 cm long; peduncles 8-24 cm long; legume 8-20 cm long, 5-7.5 cm wide, tomentose, on short stipe; p. 48 Pithecellobium catenatum D. S.
- V. Young twigs glabrous or almost glabrous; leaflets 6 or 7 pairs on a pinna; peduncles 1-3 cm long or shorter X.
- X. Flowers borne laterally on old wood of thick branches or at leafless nodes; leaflets glabrous Y.
- Y. Flowers on pedicels; pedicels 4 mm long; legume unknown; leaflets 6 (3 pairs), 9-14 cm long, 3-6.5 cm wide, on short petiolules, glabrous; side-veins prominent; p. 48. Pithecellobium Brenezii Stan.
- Y. Flowers sessile; leaflets 4-6; terminal leaflets 9-20 cm long Z.
- Z. Leaflets 6-9 cm wide; legume 11-18 cm long, 2-3.5 cm wide, glabrous; petiole short or almost none; p. 47 Pithecellobium bejizense Stan.
- Z. Leaflets 4-5 cm wide; legume about 12 cm long, densely ferruginous-tomentulose; p. 53 Pithecellobium Stevensonii (Stan.) St. & St.
- X. Flowers at ends of twigs or near axils of leaves Aa.
- Aa. Leaflets 6 or 7 on a pinna, 3-13 cm long, 1.5-4.5 cm wide, sessile, scarcely 3 times as long as wide, leathery (coriaceous); veins prominent, with 6 or 7 short spreading veins on one side, on the other side, one of the 3 veins long, arched, ascending; leaves almost sessile; p. 39, illustr. 60 Calliandra rhodocephala D. S.

- Aa. Leaflets 3-5 on a pinna Ab.
- Ab. Leaflets 3 on a pinna, with 7-8 short spreading side-veins on each side; terminal leaflets about 4 times as long as wide, 4-12 cm long, 1.5-3.5 cm wide; petiole 3-10 mm long; p. 52 Pithecellobium longifolium (H. & B.) Stan.
- Ab. Leaflets 3-5 on a pinna; terminal leaflets about 2 times as long as wide, 5-15 cm long, 1.5-6 cm wide, 7-9 52 short spreading veins on each side; p. 50, illustr. 60 Pithecellobium latifolium (L.) Bth.
- U. Terminal leaflets 1-5.5 cm long, not much larger than basal ones, that is, not twice as long Ac. cp. p. 6
- Ac. Legume gradually narrowed to base, widest near tip, obtuse or rounded and sometimes apiculate at tip, not narrowed between seeds; petiole without a gland; flowers in heads Ad.
- Ad. Leaflets 7-11 pairs, an even number, 12-23 mm long, 4-8 mm wide; legume glabrous, 7-7.5 cm long, 7-8 mm wide; stipe 2.5-3 cm long; p. 37. Calliandra carcerea St. & St.
- Ad. Leaflets 2-7 (1-3 1/2 pairs) on a pinna, an odd or even number Ae.
- Ae. Leaflets glabrous or nearly so; legume 8-10 cm long, 8-12 mm wide, glabrous, or unknown; leaflets 3 on a pinna, 1-5 cm long, 8-27 mm wide; p. 37, 39. . . Calliandra emarginata (H. & B.) Bth.
- Ae. Leaflets densely pilose above and beneath, 3-4 on a pinna, 1-2.5 cm long, 8-17 mm wide; legume 5-11 cm long, 6-7 mm wide, densely finely hairy; p. 38. Calliandra mexicana Brandegees
- Ac. Legume not gradually narrowed to base or unknown Af.
- Af. Leaflets minutely hirtellous above, velutinous-pilose beneath, 4 (2 pairs) on a pinna, 3-5 cm long, 1.5-2.7 cm wide; legume unknown; p. 48 Pithecellobium Brownii Stan.
- Af. Leaflets glabrous or nearly so, not hairy on midrib beneath, 4 pairs on a pinna, 3.5-5.5 cm long, 1.5-2.5 cm wide; legume unknown; p. 51 Pithecellobium palmanum Stan.
- E. Pinnae 2-many pairs, at least some leaves with more than 1 pair; flowers in spikes or heads or umbels or racemes Ag.
- Ag. Thorns large, hollow, not recurved, in pairs, at nodes only, usually stout; legumes with slender, spine-like beak; leaflets less than 5 mm wide, glabrous Ah. cp. p. 9
- Ah. Leaflets 8-13 mm long Ai. cp. p. 8

- Ai. Pinnae up to 20 pairs; leaflets 20-30 pairs, 8-11 mm long, 2-3.5 mm wide; legume unknown; p. 30 Acacia Allenii Janzen
- Ai. Pinnae 3 to about 8 pairs; flowers in spikes Aj.
- Aj. Pinnae 3-5 pairs; leaflets 9-18 pairs, 8-13 mm long; gland of petiole near summit; legume long-attenuate to base and tip, flattened, 8 mm wide, at least 20 cm long; stipe 2-3 cm long; p. 32 . . . Acacia Gentlei Stan.
- Aj. Pinnae about 8 pairs; leaflets about 12 mm long; legume 8-12 cm long, terete; spines compressed; flowers in spikes; p. 33 Acacia mayana Lundell
- Ah. Leaflets 2-9 mm long, glabrous or nearly so, sometimes ciliate Ak.
- Ak. Legume terete, 3-5 cm long; gland of petiole trough-shaped; leaflets 5-7 mm long, 2 mm wide; flowers in spikes; thorns terete; p. 31 Acacia cornigera (L.) Willd.
- Ak. Legume much or slightly compressed Al.
- Al. Thorns much flattened; legume opening along lower suture only, differing in this respect from almost all other species; pinnae 6-15 pairs; leaflets 12-20 pairs, 3-8 mm long; petiole and axis of leaves with circular elevated glands; p. 33, illustr. 57 Acacia Hindsii Bth.
- Al. Thorns circular or elliptical in cross section Am.
- Am. Leaflets 2-4 mm long An.
- An. Glands conical, on axis of leaves as well as petiole; leaflets 2-4 mm long, 0.5-1.2 mm wide, 65-75 pairs; thorns when mature glabrous, may be tomentose when young; p. 34.
. Acacia Ruddiae Janzen
- An. Glands not conical Ao.
- Ao. Leaflets 9-18 pairs, 2.5-3.5 mm long, obtuse, ciliate, 1-nerved; p. 33.
. Acacia hirtipes Safford
- Ao. Leaflets 18-26 pairs, 3-4 mm long; glands 2-6, circular or oval, on petiole only; pinnae about 15 pairs; thorns glabrous; leaflets less than 1 mm wide; flowers in heads Ap.
- Ap. Glands of petiole 4, conoid; similar but dark gland between each pair of pinnae; leaflets on vegetative branches 12-52 mm long, on flowering branches 6-15 pairs, on vegetative branches 14-18 pairs; spines of flowering branches 5-7 mm long; large spines 5 cm long; p. 32 Acacia Donnelliana Safford

- Ap. Glands of petiole 5-6, circular or oval, obscure on axis of leaves; leaflets 3-4 mm long, 18-26 pairs; pinnae about 15 pairs; twigs glabrous; legume flat; spines ivory-white; p. 33 Acacia globulifera Safford
- Am. Leaflets 5-9 mm long Aq.
- Aq. Glands of petiole 5-6, dome-shaped; thorns terete; no glands on axis of leaves; pinnae several to many pairs; leaflets 6-8 mm long; peduncles nearly 2 mm thick; flowers in spikes; p. 31. . . . Acacia Collinsii Safford
- Aq. Glands of petiole not dome-shaped Ar.
- Ar. Leaflets less than 1 mm wide, 6-7 mm long, many pairs; pinnae 14-28 pairs; legume 10-30 cm long; young thorns hairy; flowers in heads; p. 31.
. Acacia Cookii Safford
- Ar. Leaflets more than 2 mm wide, 5-6 mm long, 15-30 pairs; pinnae at least 15 pairs; petiole with several conic glands; axis of leaves up to 40 cm long; glands between most pairs of pinnae; p. 33.
. Acacia melanoceras Beurl.
- Ag. Thorns or spines or prickles solid or none As. cp. p. 7
- As. Petiole and axis of leaves tawny-hirsute; pinnae 8-11 pairs; leaflets 5-10 mm long, 3-6 mm wide; petiole 1-2 cm long, with 1 gland near summit; spines none; legume unknown; p. 47. Pithecellobium Barbourianum Stan.
- As. Petiole and axis of leaves not tawny-hirsute; pinnae (1-) 3-17 pairs; leaflets 10-30 mm long At.
- At. Legume deeply narrowed between seeds, bright-red or reddish; legume straight or slightly curved (falcate) Au. cp. p. 11
- Au. Young twigs almost glabrous; spines 5-15 mm long; leaflets about 25 pairs, 2-8 mm long, up to 2 mm wide; pinnae sometimes 1 pair; branches bearing prickles; p. 47, illustr. 68 Parkinsonia aculeata L.
- Au. Young twigs densely hairy; branches with or without spines Av.
- Av. Legume twisting when open; pinnae 2-9 pairs; leaflets 8-18 pairs, 1-2.5 cm long, 3-12 mm wide, acute or almost acute; young twigs with dense, rust-colored hairs; petiole without glands or glands obscure; a small gland on axis of leaves between pairs of pinnae; spines none Aw.
- Aw. Veins of leaflets prominent above and beneath; gland between pairs of pinnae erect, truncate or concave; pinnae 4-9 pairs; leaflets 10-14 pairs, 1-2.5 cm long, 5-10 mm wide, acute or almost acute; petiole sometimes with small glands; p. 48.
Pithecellobium costaricense (B. & R.) Stan.

- Aw. Veins of leaflets not prominent; gland between pairs of pinnae small circular; pinnae 2-7 pairs; leaflets 3-18 pairs, largest ones mostly 1-2 cm long, 7-11 mm wide, acute or almost acute, glabrous except sometimes midrib beneath; no gland on petiole; legume 10-18 cm long, 1 cm thick, bright-red, finely hairy; p. 48, 52.
 Pithecellobium Donnell-Smithii (B. & R.) Stan.
- Av. Legume not twisting when open; glands sometimes on axis of leaves between pairs of pinnae; spines none except sometimes in *Piptadenia constricta* Ax.
- Ax. Leaflets 3-4 mm wide, 15-20 pairs, 1-1.5 cm long, 3-nerved at base; no glands between leaflets; pinnae 7-11 pairs; petiole with 2 small glands; legume 1.5-2 cm wide; p. 47, illustr. 61 Pithecellobium austrinum Stan. & Wms.
- Ax. Leaflets (5-)7-30 mm wide; pinnae 2-5 pairs Ay.
- Ay. Leaflets 2 pairs; pinnae 2 pairs, glands between leaflets, not on petiole; p. 48 Pithecellobium Bertolonii Bth.
- Ay. Leaflets 5-12 pairs; pinnae 2-5 pairs Az.
- Az. Leaflets reticulate beneath, not above; petiole without a gland; pinnae usually 3 pairs; leaflets 7-9 pairs, 2-5 cm long, 7-27 mm wide, acute or obtuse; axis of leaves with glands between pinnae: Legume beaked; p. 49 Pithecellobium jinotegense Stan. & Wms.
- Az. Leaflets not reticulate above or beneath Ba.
- Ba. Petiole densely brown-hairy; glands of petiole and axis of leaves small; pinnae 2-3 pairs; leaflets 8-11 pairs, 1.5-4 cm long, 7-30 mm wide; legume almost terete, up to 1 cm thick Bb.
- Bb. Leaflets obtuse, puberulent to glabrate beneath, 1.5-4 cm long, 8-30 mm wide; pubescence of twigs and petiole not tomentose; p. 49 Pithecellobium erythrocarpum Stan.
- Bb. Leaflets acute or almost acute, puberulent beneath on midrib, otherwise glabrous or nearly so, 2.5-3 cm long, 7-20 mm wide; twigs, petiole and axis of leaves tomentose; p. 52, 53 Pithecellobium tenellum Stan.
- Ba. Petiole not brown-hairy Bc.
- Bc. Gland of petiole none; pinnae 1-5 pairs; leaflets 5-12 pairs, 3-5 cm long, 5-10 mm wide; strigose on midrib, especially beneath, otherwise glabrous; a gland between each pair of pinnae; p. 53. Pithecellobium sophorocarpum Bth.
- Bc. Gland of petiole large, orbicular, near middle; no glands between leaflets; pinnae 3-5 pairs; leaf-

lets 3-9 pairs, 6-17 mm long, 11 mm wide; twigs prickly or not; p. 47.
 *Piptadenia constricta* (Micheli & Rose) Macbride

Af. Legume not or only slightly narrowed between seeds or unknown Bd. cp. p. 9

Bd. Twigs densely tomentose; pinnae 3-4 pairs; leaflets 6-11 pairs, 1-2 cm long, 3-7 mm wide; legume 2-2.5 cm wide; p. 35 *Albizzia tomentosa* (Micheli) Stan.

Bd. Twigs glabrous or hairy, not tomentose Be.

Be. Leaflets (4-)5-40(-90) mm wide; pinnae (1-)2-13 pairs; cp. p. 15

Bf. Legume when mature coiled into a circle or twisted Bg.

Bg. Twigs densely brown-hairy; leaflets 5-7 mm wide, glabrous or nearly so except midrib; valves 1.5 cm wide; p. 53.
 *Pithecellobium Zollarianum* St. & St.

Bg. Twigs and leaves glabrous or puberulent Bh.

Bh. Leaflets alternate, 11-21 (not pairs), on petiolules 3 mm long; leaflets 19-44 mm long, 10-22 mm wide, minutely hairy above and beneath; pinnae 2-5 pairs; legume 12-19 mm wide, curved, indented or depressed between seeds; p. 34, illustr. 59 *Adenanthera pavonina* L.

Bh. Leaflets opposite, 5-11 pairs, 1-2.5 cm long, 1-6 (typically 3-4) cm wide, sessile, reticulate-veined above and beneath, glabrous or hairy; axis of leaves bearing 1 club-shaped gland; pinnae 2-3 pairs; p. 51.
 *Pithecellobium Peckii* Blake

Bf. Legume when mature straight or slightly curved (falcate) or strongly arcuate, shallower than a semi-circle, or unknown Bi.

Bi. Leaflets very large, 18-33 cm long, 1.8-8.4 cm wide; pinnae many pairs; legume unknown; p. 49 *Pithecellobium Englesingii* Stan.

Bi. Leaflets smaller, 5-70 mm long, 3-27 mm wide Bj. Pinnae about 20 pairs; leaflets 15-30 mm long, 4-7 mm wide; legume 2.5-5 cm wide near tip, tapering to base, about 10 cm long, 1-seeded; p. 54
 *Schizolobium parahybum* (Vell.) Blake

- Bj. Pinnae (1-)2-8(-11) pairs or an odd number, at least some leaves with more than 1 pair Bk. cp. p. 11
- Bk. Axis of leaves and twigs bearing prickles Bl.
- Bl. Legume puberulent, later glabrate, not spiny, 4-8 cm long, 1.2-2 cm wide; pinnae 2-3 pairs; leaflets 1-3 pairs, 1-4 cm long, 1-3 cm wide; p. 36, illustr. 67 Caesalpinia vesicaria L.
- Bl. Legume densely covered with spine-like prickles Bm.
- Bm. Legume 1-seeded, about 9 cm long, 5.5 cm wide; pinnae about 6 pairs; leaflets 6-7 pairs, 6-8.5 cm long; prickles recurved; p. 36 Caesalpinia urophylla (D. S.) Stan.
- Bm. Legume several-seeded, 5-12 cm long, 6 cm wide; pinnae 4-8 pairs; prickles straight or hooked Bn.
- Bn. Stipules leaf-like, sometimes 5 cm wide; pinnae 4-8 pairs; bracts of inflorescence reflexed; seeds gray; prickles straight; p. 35 Caesalpinia Crista L.
- Bn. Stipules none or awl-like; pinnae 3-6 pairs; bracts erect or spreading; seeds yellow or olive; prickles hooked (uncinate); p. 35 Caesalpinia Bonduc (L.) Roxb.
- Bk. Axis of leaves not bearing prickles Bo.
- Bo. Legume winged; pinnae several pairs; leaflets about 15 mm long, 6 mm wide, obtuse; petiole 5 cm long; p. 47 Peltophorum inerme (Roxb.) Naves
- Bo. Legume not winged Bp.
- Bp. Legume not opening when mature; petiole without a gland; pinnae 9-11 pairs; leaflets 12-18 pairs, 8-10(-20) mm long, mostly alternate, puberulent beneath, round at tip; p. 54 Stryphnodendron excelsum Harms
- Bp. Legume opening when mature Bq.
- Bq. Gland oblong, 1 cm long, between lowest pair of pinnae; pinnae usually 3 pairs; leaflets 5-8 pairs, 2-5 cm long, 1-2.2 cm wide; legume about 10 cm long, 2 cm wide, much curved; p. 51 Pithecellobium macradenium Pittier
- Bq. Gland between lowest pair of pinnae, if any, not 1 cm long Br.
- Br. Petiole with 1 or more usually large glands distinctly below lowest pinnae; glands sometimes on axis of leaves also between 1 or more pairs of pinnae Bs. cp. p. 14
- Bs. Axis of leaves glabrous or nearly so or minutely pubescent, without prickles Bt.

- Bt. Legume pubescent, 10-18 cm long, 1.5-2.5 cm wide, on a stipe; leaflets 1.2-2.2 cm long, 5-8 mm wide, reticulate-veined; gland of petiole oblong; p. 41, illustr. 64 Leucaena Shannoni D. S.
- Bt. Legume glabrous; leaflets 15-60 mm long Bu.
- Bu. Glands none on axis of leaves between pinnae Bv.
- Bv. Pinnae 6 or 8 (3 or 4 pairs); axis of leaves about 6 cm long; leaflets 6-10, 15-50 mm long, 7-25 mm wide, densely canescent-pubescent beneath when young; p. 41. Leucaena multicapitula Schery
- Bv. Pinnae 4-6 (2-3 pairs); leaflets 2-5 pairs, usually 3-4 pairs, 2-4 cm long, 10-20 mm wide, puberulent beneath; veins very prominent above; p. 34.
. Albizzia adinocephala (D. S.) B. & R.
- Bu. Glands on axis of leaves between pairs of pinnae Bw.
- Bw. Legume 6-9 cm long, 2.5 cm wide, castaneous; leaflets 1-3 cm wide, not reticulate-veined; gland of petiole small; p. 50.
. Pithecellobium leucocalyx (B. & R.) Stan.
- Bw. Legume 13-30 cm long Bx.
- Bx. Pinnae 2-4 pairs; leaflets 2-5 cm long; legume 15-30 cm long, 2-5 cm wide; p. 35, illustr. 65 Albizzia Lebbeck (L.) Bth.
- Bx. Pinnae 5-8 pairs; leaflets 1.5-2 cm long, legume 13 cm long, 1 cm thick; seeds black; p. 53 Pithecellobium Tonduzii (B. & R.) Stan.
- Bs. Axis of leaves pilose or short-pilose or tomentulose; legume 2-3.5 cm wide By.
- By. Spines at nodes short, recurved; leaflets 7-15 mm wide, 2-3 pairs, 1-2.5 cm long; pinnae 2 pairs; legume glabrous, flat or compressed, straight, 10-15 cm long, 2-3 cm wide; p. 52. Pithecellobium platylobum (Sprengel) Urban
- By. Spines none; glands on axis of leaves between pairs of pinnae; pinnae 2-6 pairs; twigs tomentose; leaflets 10-25 mm wide, 3-7 pairs, 1.5-4 cm long; pinnae 2-6 pairs; gland of petiole near middle; legume 15-20 cm long, 2.5-3.5 cm wide; p. 35 Albizzia longepedata (Pittier) B. & R.
- Br. Petiole without a gland distinctly below lowest pinnae or glands obscure Bz.
- Bz. Axis of leaves with glands between pairs of pinnae, sometimes between lowest or terminal pair only Ca.
- Ca. Spines at nodes of branches; glands on axis of leaves large, club-shaped, more than 1; leaflets 1-3 cm long, 5-10 mm wide, gradually narrowed to obtuse tip, glabrous except midrib; pinnae 3-4 pairs; legume unknown; p. 51 Pithecellobium pistaciifolium Stan.

- Ca. Spines none; glands on axis of leaves orbicular, not club-shaped; young twigs densely short-pilose; pinnae with a small orbicular gland between each pair; leaflets 4-20 mm wide Cb.
- Cb. Leaflets 4-10 mm wide, 1-4.5 cm long, 6-12 pairs, hairy on veins beneath; pinnae 2-3 pairs; legume unknown; p. 49. Pithecellobium graciliflorum Blake
- Cb. Leaflets 20 mm wide, 2-8 pairs, 2-4 cm long, densely velutinous-pilose beneath; pinnae 2-6 pairs; legume 10-20 cm long, 1-2 cm wide, glabrous; p. 52, illustr. 54 Pithecellobium Saman (Jacq.) Bth.
- Bz. Axis of leaves without glands between pinnae Cc. cp. p. 13
- Cc. Legume gradually narrowed to base, attenuate, widest near tip, subacute or rounded, straight or nearly so, or or unknown; spines none Cd.
- Cd. Legume 2.5-5 cm wide, 8-12 cm long, 1-seeded; pinnae and leaflets several to many pairs; leaflets 1.5-3 cm long, 4-7 mm wide; p. 54
- Schizolobium parahybum (Vell.) Blake
- Cd. Legume 0.6-1.5 cm wide; pinnae 1-3 pairs Ce.
- Ce. Leaflets 1-2 cm long, 6-12 mm wide, 3-7 pairs; legume 6-10 mm wide near tip; p. 36, illustr. 59 Calliandra capillata Bth.
- Ce. Leaflets 2-3.5 cm long Cf.
- Cf. Leaflets 10-15 pairs, oblong, acute; legume 8 cm long; pinnae 3 pairs; twigs glabrous; p. 37 . . . Calliandra costaricensis (B. & R.) Stan.
- Cf. Leaflets 1-8 pairs, rounded or obtuse at tip; pinnae 1-3 pairs Cg.
- Cg. Leaflets 4-6 pairs, 10-20 mm wide; legume 6-10 mm wide near tip; twigs densely short-pilose; p. 38 . Calliandra penduliflora Rose
- Cg. Leaflets 6-8 pairs, largest ones 18-20 mm wide; legume 1.5 cm wide near tip; twigs glabrous; p. 39. . Calliandra Quetzal D. S.
- Cc. Legume not gradually narrowed to base; pinnae 2-9 pairs; leaflets 2-65 pairs, 4-35 mm long Ch.
- Ch. Spines on branches, not on axis of leaves; leaflets 7-11 pairs; legume about 2 cm long; p. 43.
- Mimosa canahuensis St. & St.
- Ch. Spines none Ci.
- Ci. Leaflets 16-60 mm long, 4-7 mm wide; legume 2-5 cm wide near tip; pinnae 2-5 pairs Cj.
- Cj. Leaflets 4-6 pairs, 1.5-2.5 cm long Ck.

- Ck. Leaflets (7-)11-13 mm wide; legume 6-8 cm long, about 18 mm wide, dark-dotted; p. 35 Caesalpinia affinis Hemsley
- Ck. Leaflets 5-10 mm wide; legume 5-9 cm long, 20-25 mm wide, not dark-dotted; p. 35. Caesalpinia Conzattii (Rose) Stan.
- Cj. Leaflets 5-8 pairs, 1-6 cm long, 2-3 cm wide; legume 2.5-3 cm wide, not dark-dotted; pinnae 2-4 pairs Cl.
- Cl. Legume 6-10 cm long, on short stipe; leaflets 2-5 cm long, 2-3 cm wide; twigs and axis of leaves puberulent or glabrate; p. 36 Caesalpinia violacea (Miller) Stan.
- Cl. Legume 10-15 cm long, on long stipe; leaflets 3-6 cm long, 2-2.5 cm wide; twigs and axis of leaves densely velutinous-pilose; p. 36 Caesalpinia velutina (B. & R.) Stan.
- Ci. Leaflets 4-15 mm long Cm.
- Cm. Leaflets pilose beneath, not only on veins; pinnae 2-5 pairs; leaflets 2-6 pairs, mostly 2.5-4 cm long; twigs and petiole pubescent; p. 36 . . . Caesalpinia Recordii B. & R.
- Cm. Leaflets glabrous beneath or hairy on veins only Cn.
- Cn. Pinnae 4-9, not always in pairs, that is, alternate or opposite; leaflets dark-dotted beneath, 1-3 cm long, 7-15 mm wide; legume 8 cm long, 2 cm wide, acuminate, glabrous; p. 35 Caesalpinia Gaumeri Greenman
- Cn. Pinnae in pairs, an even number; legume 1.5-2.5 cm wide Co.
- Co. Leaflets about 10 pairs on a pinna, 10-23 mm long, 5-10 mm wide; pinnae 3-9 pairs, opposite or alternate; legume 6-12 cm long, glabrous, 1.5-3 cm wide, in a raceme; lowest pedicels 6-9 cm long in fruit; p. 36, illustr⁶⁷ Caesalpinia pulcherrima (L.) Sw.
- Co. Leaflets 1-4 pairs on a pinna Cp.
- Cp. Pinnae 3-4 pairs; leaflets 3-4 pairs, 1.5 cm long, 4-15 mm wide; legume 8-12 cm long, 1.5-2.5 cm wide, puberulent; p. 35. Caesalpinia exostemma DC.
- Cp. Pinnae 4-7 pairs; leaflets 2-3.5 cm long, 4-15 mm wide; legume 2-2.5 cm wide; p. 35. Caesalpinia yucatanensis Greenman
- Be. Leaflets 0.5-4(-5) mm wide Cq. cp. p. 11
- Cq. Legume or valves when mature coiled or much curved laterally before opening, often more than a semicircle; leaflets 8-40 pairs, 0.5-8 mm wide; pinnae 10-20 pairs Cr.
- cp. p. 16
- Cr. Leaflets 2-7(-9) mm long, glabrous ; spines none Cs.
- Cs. Axis of leaves without a gland between pairs of pinnae; axis pubescent; leaflets obtuse or rounded at tip, 3-9 mm long, up to 2 mm wide, glabrous, usually dark-dotted; legume up to 6 cm long, 2 cm wide, much coiled in age, apparently not opening;

- petiole 1-2 cm long, without a gland; pinnae 4-10 pairs; spines none; p. 35 . Caesalpinia coriaria (Jacq.) Willd.
- Cs. Axis of leaves with a gland between all or most pairs of pinnae; axis tomentulose Ct.
- Ct. Legume closed in center, 5 cm in diameter; leaflets 2-4 mm long, about 0.5 mm wide, midrib off center; petiole with 1 or more usually large glands; spines none; p. 40. Enterolobium Schomburgkii Bth.
- Ct. Legume open in center; petiole with 1 or more usually large glands; spines none Cu.
- Cu. Leaflets almost 2 mm wide, midrib nearly in center; pinnae 12-16 pairs; leaflets 5-7 mm long; p. 52
Pithecellobium pseudo-Tamarindus (Britton) Stan.
- Cu. Leaflets 3-5 mm wide, 8-15 mm long; pinnae 4-10 pairs; glands of axis of leaves small, orbicular; leaflets obtuse; legume usually much curved, almost terete, brown-tomentulose; flowers unknown; p. 53
 Pithecellobium vulcanorum St. & St.
- Cr. Leaflets (7-)8-20 mm long, 16-40 pairs, 0.5-4 mm wide Cv.
- Cv. Spines at nodes; pinnae 10-17 pairs; leaflets 9-18 mm long, 2-4 mm wide; legume curved and coiled; petiole without a gland; p. 51. . Pithecellobium macrandrium D. S.
- Cv. Spines none Cw.
- Cw. Legume closed in center (circinate), 8-10 cm in diameter; pinnae 5-15 pairs; leaflets 20-30 pairs, 8-15 mm long, 2-4 mm wide; petiole with or without a gland; p. 40: 47, 61 Enterolobium cyclocarpum (Jacq.) Griseb.
- Cw. Legume open in center; twigs densely brown-hairy; leaflets glabrous or nearly so or puberulent; petiole with 1 or more usually large glands; leaflets 0.5-4 mm wide Cx.
- Cx. Legume almost terete, much curved or coiled or twisted, puberulent or glabrate; leaflets 8-12 mm long, (0.5-)1-3 mm wide, palmately veined at base; glands on axis of leaves; p. 47
 Pithecellobium arboreum (L.) Urban
- Cx. Legume flat or compressed, coiled and twisted when open, glabrous or nearly so; valves 1 cm wide; leaflets 7-11 mm long, 2.5-4 mm wide; p. 49
 Pithecellobium halogenes Stan.
- Cq. Legume when mature straight or slightly curved (falcate) or unknown, sometimes twisted or recurved when opening; pinnae 2-20 or more pairs, at least some leaves with more than 2 pairs of pinnae Cy.

- Cy. Legume gradually narrowed to base (attenuate), or unknown; petiole without a gland; gland between lowest pair of pinnae or none Cz.
- Cz. Legume not opening when mature; pinnae 9-11 pairs; leaflets 12-18 pairs, 8-10(-20) mm long, mostly alternate, puberulent beneath, rounded at tip; p. 54.
 Stryphnodendron excelsum Harms
- Cz. Legume opening when mature Da.
- Da. Legume on a stipe, attenuate to base; leaflets 9-20 pairs, 8-18 mm long Db.
- Db. Legume 5-6 cm long, almost 1 cm wide near tip, lightly pubescent; pinnae 4-10 pairs; leaflets 8-9 mm long, 1-4 mm wide; petiole with or without a gland; p. 34. Acacia villosa (Sw.) Willd.
- Db. Legume 10-18 cm long Dc.
- Dc. Legume 2-2.5 cm wide, glabrous or nearly so; stipe long; leaflets obtuse, 12-20 pairs; pinnae 3-4 pairs; axis of leaves with a large gland between each pair of pinnae; p. 34.
 Albizzia idiopoda (Blake) B. & R.
- Dc. Legume 1.5 cm wide, densely puberulent; stipe stout; leaflets acute, 4-9 pairs; pinnae 3-10 pairs; petiole with or without a gland; p. 41, illustr. 64. . . . Leucaena latisiliqua (L.) Gillis
- Da. Legume not on stipe, 4-12 cm long Dd.
- Dd. Leaflets pubescent, 7-22 pairs, oblong, 8-12 mm long; pinnae 3-6 pairs; p. 38 Calliandra mollis Stan.
- Dd. Leaflets glabrous above but sometimes ciliate De.
- De. Legume glabrous or nearly so Df.
- Df. Pinnae about 15-20 or more pairs; leaflets 25-30 or more pairs, 6-10 mm long, 1-2 mm wide Dg.
- Dg. Legume almost 8 cm long, 12 mm wide, margins much thickened; peduncles 5-8 mm long; leaflets 3-10 mm long; p. 37
 Calliandra confusa Sprague & Riley
- Dg. Legume up to 4 cm wide near tip, 20-30 cm long; valves recurved when open; leaflets 6-9 mm long, 1-2 mm wide; p. 47. . .
Pentaclethra macroloba (Willd.) Kuntze
- Df. Pinnae 2-7 pairs Dh.
- Dh. Branches 4-angled; peduncles 4-7 cm long; pinnae 4-7 pairs; margins of valves much thickened; leaflets 15-25 pairs, 6-12 mm long; p. 39
 Calliandra tetragona (Willd.) Bth.

Dh. Branches terete Di.

Di. Leaflets 4-6 mm long, 0.8-1 mm wide, 14-16 pairs; pinnae 2-4 pairs; leaflets acute glabrous; p. 38.
 Calliandra pallida (B. & R.) Stan.

Di. Leaflets 8-16 mm long, 10-35 pairs, acute or obtuse; pinnae 2-6 pairs; petiole 1-3 cm long or less; legume glabrous or lightly pubescent; p. 37, 39
 Calliandra caracasana (Jacq.) Bth.

De. Legume hairy; leaflets acute or obtuse Dj. cp. p. 17

Dj. Pinnae 2-5 pairs Dk.

Dk. Leaflets acute, about 20 pairs, 8-12 mm long; legume 9-10 cm long, 9 mm wide near tip, densely white-lanate; pinnae usually 3 pairs; p. 36.
 Calliandra belizensis (B. & R.) Stan.

Dk. Leaflets obtuse or rounded Dl.

Dl. Pinnae 30-60 mm long, 2-3 pairs; leaflets 5-9 mm long, obtuse, spreading-pilose beneath; p. 38.
 Calliandra Molinae Stan.

Dl. Pinnae 2-20 mm long, 3-5 pairs; leaflets 4-7 mm long, glabrous except minutely ciliate; legume about 8 mm wide Dm.

Dm. Pinnae 5-20 mm long, 3 pairs; petiole usually less than 1 cm long; legume flat, up to 8 cm long; p. 37
 Calliandra Cumingii Bth.

Dm. Pinnae 20-30 mm long, 3 pairs; petiole 1-1.5 cm long; legume 4-angled, 7-9 cm long; p. 39
 Calliandra tapirorum Stan.

Dj. Pinnae 7-20 pairs; leaflets 20-40(-65) pairs, 3-7 mm long; legume 12-15 mm wide, hispid or pilose or strigose; Dn.

Dn. Leaflets somewhat curved, acute; midrib off center, 30-40 pairs, 4-7 mm long, 0.75-2 mm wide, glabrous above; legume 8-12 cm long, 1.5-2 cm wide near tip, obtuse, brown-hispid; pinnae 7-12 pairs; p. 37.
 Calliandra Houstoniana (Miller) Stan.

Dn. Leaflets straight or nearly so; midrib on center or nearly so; leaflets acute or obtuse Do.

Do. Legume linear-spatulate, margins thick, scarcely 1 cm wide, pubescent; p. 39
 Calliandra Pittieri Stan.

Do. Legume not spatulate, 12-15 mm wide, beaked, densely hispid; p. 37, illustr. 59
 Calliandra grandiflora Rose

Cy. Legume not gradually narrowed to base (not attenuate) Dp.
cp. p. 17

Dp. Branches bearing spines or prickles Dq. cp. p. 21

Dq. Spines scattered, not at nodes only, sometimes on old wood only; legume not on stipe; gland of petiole sometimes small Dr. cp. p. 20

Dr. Petiole also bearing spines or prickles; axis of leaves also spiny and bearing at upper nodes at least prominent glands or appendages Ds.

Ds. Petiole with an oblong gland; pinnae 20 or more pairs; leaflets 4 mm long, less than 1 mm wide; p. 34. Acacia tenuifolia (L.) Willd.

Ds. Petiole without a gland Dt.

Dt. Pinnae 5-8 pairs; leaflets 6-8 mm long, 1 mm wide; legume spiny on margins and stipe; stipe long; p. 43.
. . . Mimosa Donnell-Smithii (B. & R.) St. & St.

Dt. Pinnae 2-5 pairs; leaflets 3-20 mm long, 1-2 mm wide Du.

Du. Pinnae mostly 2-3 pairs; side-veins of leaflets not evident; legume 4 mm wide, with long beak; p. 54.
. Schrankia leptocarpa DC.

Du. Pinnae mostly 4-5 pairs; side-veins of leaflets evidently reticulate beneath; legume 5-6 mm wide, with short beak; p. 54.
. Schrankia hamata H. & B.

Dr. Petiole not spiny Dv.

Dv. Petiole without a gland; leaflets 3-5 mm long; legume with or without stiff, straight, marginal spines; p. 45. Mimosa platycarpa Bth.

Dv. Petiole bearing 1 or more glands; legume without marginal spines Dw.

Dw. Young leaflets gland-dotted; gland of petiole oblong; leaflets many pairs, 5-10 mm long, glabrous above and beneath except, when young, sometimes hairy; axis of leaves with or without spines; branches usually with spines; p. 47. . Piptadenia flava (Sprengel) Bth.

Dw. Young leaflets and others not gland-dotted; legume usually on a stipe Dx.

Dx. Midrib of leaflets off center Dy.

Dy. Axis of leaves spiny; gland of petiole small; leaflets about 10 mm long, 2-3 mm wide; branches with or without spines; p. 33. . Acacia glomerosa Bth.

- Dy. Axis of leaves not spiny, pubescent, bearing many glands; glands of petiole 1 or 2, cupulate; Leaflets 8-10 mm long; stipe short; p. 33 Acacia Hayesii Bth.-
- Dx. Midrib of leaflets not much off center; leaflets 3-7 mm long, 0.5-1 mm wide, glabrous above; legume 6-15 cm long, 1.5-2.5 cm wide, puberulent or tomentulose Dz.
- Dz. Petiole bearing usually 2 glands, about 2 cm long axis of leaves up to 15 cm long; pinnae 6-20 pairs; leaflets 20-40 pairs; legume tomentulose; axis of leaves bearing glands; p. 33 Acacia riparia HBK.
- Dz. Petiole bearing only 1 gland; pinnae 7-10 pairs; leaflets 15-30 pairs, puberulent or glabrous; legume puberulent; p. 33, 34 . . Acacia riparioides (B. & R.) Stan.
- Dq. Spines at nodes only Ea.
- Ea. Legume on a short stipe, densely tomentulose at least when young; pinnae 6-9 pairs; leaflets 3-10 mm long, 1-2 mm wide, glabrous above, puberulent beneath; legume 2-2.5 cm wide; spines sometimes at nodes; p. 47.
. Pithecellobium albicans (Kunth) Bth.
- Ea. Legume not on stipe, often glabrous, sometimes puberulent at first, not tomentulose; spines on branches at nodes Eb.
- Eb. Gland on axis of leaves between at least the terminal pair of pinnae Ec.
- Ec. Pinnae 4-10 pairs; leaflets 8-30 pairs, 6 mm long, little more than 1 mm wide; gland of petiole club-shaped; petiole 1-2 cm long; legume compressed, glabrous; p. 51
. Pithecellobium mangense (Jacq.) Macbride
- Ec. Pinnae 8-60 pairs; petiole and axis of leaves hairy; legume almost terete, glabrous or nearly so or puberulent; leaflets many, not quite 3 mm long, not quite 1 mm wide; petiole about 1 cm long; p. 33
. Acacia macracantha H. & B.
- Eb. Gland none on axis of leaves between pairs of pinnae; pinnae (1-)2-many pairs; legume 6-30 mm wide or thick Ed.
- Ed. Legume 6-8 mm thick, swollen densely hairy, 8-14 cm long, often slightly narrowed between seeds; leaflets 4-7 mm long, about 1 mm wide, obtuse; p. 34, illustr. 57 Acacia tortuosa (L.) Willd.
- Ed. Legume 7-30 mm wide or thick Ee.
- Ee. Legume 15-30 mm wide; leaflets 2-3 mm long, pubescent; pinnae many pairs; young twigs densely hairy; spines up to 15 mm long; p. 33
. Acacia pennatula (S. & C.) Bth.

- Ee. Legume 7-15 mm wide or thick; pinnae 1-6 pairs; legume glabrous Ef.
- Ef. Leaflets 4 mm long, 1 mm wide, 10-25 pairs, glabrous or nearly so beneath; petiole up to 1 cm long; petiole and axis of leaves hairy; legume glabrous, swollen (turgid), 1 cm thick; p. 32, illustr. 57 Acacia Farnesiana B. & R.
- Ef. Leaflets 8-15 mm long Eg.
- Eg. Leaflets 5-10 pairs, 8-13 mm long; pinnae 2-4 pairs; gland of petiole club-shaped; legume 7-12 mm wide; branches with or without spines; p. 51, 53 . . . Pithecellobium leucospermum Brandegee
- Eg. Leaflets 10-20 pairs, mostly 15 mm long, 1-5 mm wide, glabrous or sparsely pubescent; pinnae 1-3 pairs; gland of petiole small or none; legume 7-20 cm long, 8-15 mm wide; spines 1-4 cm long; p. 51, 53, illustr. 66 Prosopis juliflora (Sw.) DC.
- Dp. Branches without spines or prickles Eh. cp. p. 19
- Eh. Legume very large, 40-60 cm long, 5-7 cm wide; pinnae 10-25 pairs; leaflets 4-10 mm long, 3-4 mm wide; legume not on stipe; p. 39. Delonix regia (Bojer) Raf.
- Eh. Legume shorter, narrower; pinnae 3-8 pairs; not on stipe
- Ei. Petiole and leaflets stellate-hairy, 7-12 pairs, 3-5 mm wide; pinnae 5-8 pairs; legume 2-2.5 cm wide; p. 35 Caesalpinia eriostachys Bth.
- Ei. Petiole and leaflets not stellate-hairy Ej.
- Ej. Legume not on stipe Ek.
- Ek. Leaflets 2-6 mm wide El. cp. p. 22
- El. Legume 11-12 cm long, 16-18 mm wide; pinnae 4-6 pairs; leaflets obtuse Em.
- Em. Leaflets about 25 pairs, 6-8 mm long; pinnae about 6 pairs; p. 42. Lysiloma Seemannii B. & R.
- Em. Leaflets 9-12 pairs, 7-12 mm long, 3-4 mm wide, glabrous above, puberulent and strongly nerved beneath; petiole with oblong gland near middle; p. 34. Albizzia Hummeliana B. & R.
- El. Legume 2-3 cm wide; leaflets 10-35 pairs En.
- En. Pinnae 2-5 pairs; leaflets 10-30 pairs, 8-15 mm long, , 2-4 mm wide, wedge-shaped at base; legume 8-15 cm long, 2-2.5 cm wide valves separating at maturity from persistent margins; gland of petiole large; p. 41, illustr. 65 Lysiloma bahamense Bth.

- En. Pinnae 6-many pairs; leaflets 12-35 pairs, 10-12 mm long, 2-3 mm wide, midrib much off center; legume up to 20 cm long, 3 cm wide, rounded to almost truncate at tip, valves not separating from margins; gland of petiole small; branches with or without spines; p. 22, 33 Acacia glomerosa Bth.
- Ek. Leaflets 0.5-2 mm wide, glabrous except sometimes ciliate or hairy on midrib Eo.
- Eo. Legume 3-5 mm wide; petiole usually no more than 5 mm long; leaflets 10-20 pairs; pinnae 1-7 pairs; gland between lowest pair of pinnae; small shrub or almost an herb; p. 39, illustr. 61 Desmanthus virgatus (L.) Willd.
- Eo. Legume 8-30 mm wide Ep.
- Ep. Pinnae 2-3(-4) pairs; leaflets 4-5 mm long, 0.8-1 mm wide; no gland on petiole; legume 5-10 cm long, 12 mm wide; p. 22, 31 Acacia Baileyana F. Mueller
- Ep. Pinnae 5-25 pairs Eq.
- Eq. Pinnae 13-25 pairs; axis of leaves with a gland between each pair of pinnae; legume 3.5-6 cm long, 9-12 mm wide, glabrous; leaflets 4-8 mm long, 0.5 mm wide; spines none; p. 32 Acacia dealbata Link
- Eq. Pinnae 5-13 pairs Er.
- Er. Petiole with 1 or more glands Es.
- Es. Leaflets acute; pinnae 8-13 pairs; petiole with a gland, 1-4 cm long; branches with or without thorns; margins of legume not elevated; p. 19, 47 Piptadenia flava (Sprengel) Bth.
- Es. Leaflets obtuse, 30-50 pairs; petiole with 1 or more glands, 1-5 cm long; pinnae 5-10 pairs; margins of legume elevated; legume 1.5-2.5 cm wide; p. 34 Albizzia caribaea (Urban) B. & R.
- Er. Petiole without a gland Et.
- Et. Legume much coiled in age, up to 6 cm long, 2 cm wide; petiole usually 1-2 cm long; pinnae usually about 15; legume twisted; leaflets 12-28 pairs, usually black-dotted beneath, 4-8 mm long; p. 35 Caesalpinia coriaria (Jacq.) Willd.
- Et. Legume straight or nearly so; pinnae 6-12 pairs or more; legume 4-8 cm long, 8-12 mm wide; leaflets 4-7 mm long; p. 30 Acacia angustissima (Miller) Kuntze
- Ej. Legume on a stipe Eu. cp. p. 21
- Eu. Leaflets hairy beneath more than sparsely Ev.
- Ev. Pinnae 4-5 pairs; leaflets hairy above, 3-5 mm long; legume 2-2.8 cm wide; petiole with large gland above middle; p. 42 Lysiloma Kellermanii B. & R.

Ev. Pinnae 5-20 pairs Ew.

Ew. Young branches tomentose, later glabrous; petiole 2-3 cm long, usually without a gland; leaflets 10-25 pairs, 4-6 mm long, 1-2 mm wide; midrib off center; axis of leaves without a gland; pinnae 7-15 pairs; legume 2 cm wide; p. 25, 48
 . . . Pithecellobium carbonarium (Britton) Niez. & Nevl.

Ew. Young branches puberulent or glabrate or glabrous, not tomentose; petiole with a gland below lowest pinnae; pinnae 6-12 pairs at least Ex.

Ex. Legume 2-2.5 cm wide, 9-12 cm long; leaflets 18-32 pairs, glabrous above, 1-2 mm wide or narrower; pinnae 6-10 pairs Ey.

Ey. Leaflets sparsely silky beneath, 4-6 mm long, 0.15-1.5 mm wide; legume glabrous, margins not thickened; stipe 5-10 mm long; p. 32
 Acacia Deamii (B. & R.) Stan.

Ey. Leaflets puberulent beneath, 3-10 mm long, 1-2 mm wide; legume densely ferruginous-tomentose, margins thickened; stipe short; p. 20, 47
 Pithecellobium albicans (Kunth) Bth.

Ex. Legume 1.3-2 cm wide Ez.

Ez. Pinnae 5-11 pairs; leaflets when young appressed-hairy beneath, in age glabrous; legume 1.3-1.3-1.6 cm wide; veins of leaflets elevated; stipe stipe 1.5 cm long; p. 32
 Acacia dolichostachya Blake

Ez. Pinnae 12-20 pairs; leaflets 25-35 pairs, 3-5 mm long, 0.5-1.5 mm wide, pubescent beneath; axis of leaves bearing at tip a gland; legume 1.5-2 cm wide; stipe 1 cm long; p. 40.
 Leucaena guatemalensis B. & R.

Eu. Leaflets glabrous beneath or nearly so, even when young, or sparsely appressed-pilosulous or minutely puberulent, sometimes ciliate Fa. cp. p. 22

Fa. Side-veins prominent; leaflets 3-5 mm long; petiole without a gland Fb.

Fb. Leaflets revolute; pinnae 2-8 pairs; legume 3-5 cm long, 8-10 mm wide, not on stipe, long acuminate, pubescent; p. 33 Acacia polypodioides Stan.

Fb. Leaflets not revolute, 1-2 mm wide, obtuse, ciliate; legume 2-3 cm long, at least 1 cm wide, on a stipe, glabrous, rounded at tip; pinnae 2-4 pairs; petiole without a gland; p. 46 Neptunia pubescens Bth.

Fa. Side-veins not prominent Fc.

Fc. Axis of leaves glabrous or nearly so, or sparsely appressed-pilosulous; legume 0.3-1.5(1.8) cm wide, rounded at tip; leaflets obtuse; pinnae 2-4 pairs Fd.

Fd. Plant floating; legume not at right angle to stipe, 2-2.5 cm long, 8-10 mm wide; leaflets 6-13 mm long; petiole without a gland; p. 46.
 Neptunia prostrata (Lam.) Baill.

Fd. Plant not floating; petiole with a gland near summit; legume 2-5 cm long, 8 mm wide, at right angle to stipe; leaflets 4-10 mm long; p. 46.
 Neptunia plena (L.) Bth.

Fc. Axis of leaves hairy, at least puberulent Fe.

Fe. Leaflets 2-7 mm long; petiole with 1 or more glands

/ Ff. cp. p.

Ff. Leaflets 2-3 mm long, 0.5 mm wide, 7-22 pairs, acute, glabrous or nearly so; pinnae 12-22 pairs; gland of petiole near middle; twigs puberulent or almost glabrous; flowers in spikes; legume unknown; p. 31. Acacia centralis (B. & R.) Lundell

Ff. Leaflets 3-5 mm long, glabrous or nearly so, usually ciliate; pinnae 7-25 pairs; twigs densely short-pilose; axis of leaves densely pubescent Fg.

Fg. Legume 3-3.5 cm wide, glabrous, on stipe Fh.

Fh. Legume beaked; leaflets 4-5 mm long, obtuse, 25-50 pairs; petiole with a gland; flowers in racemes; pinnae 10-25 pairs; p. 41 .
 Lysiloma auritum (Schlecht.) Bth.

Fh. Legume not beaked; leaflets 3-5 mm long, 40-60 pairs, obtuse or almost acute; pinnae 7-15 pairs; petiole with 1 or more glands; flowers in spikes; p. 41
 Lysiloma desmostachys Bth.

Fg. Legume (1.8-)2.5-3 cm wide, obtuse or acute; leaflets 4-8(-11) mm long, acute to obtuse Fi.

Fi. Pinnae 10-25 pairs; legume on stipe; leaflets 2.5-7 mm long Fj.

Fj. Legume 1.5-1.8 cm wide; stipe 0.6-1 cm long; leaflets 4-5 mm long, 0.5-1 mm wide, acute; pinnae 10-25 pairs; axis of leaves puberulent; p. 40 Leucaena brachycarpa Urban

Fj. Legume 2.2-2.5 cm wide, rust-colored, glabrous; stipe 1.5-3 cm long; pinnae 15-25 pairs; leaflets 2.5-4 mm long; axis of leaves short-pilose; flowers in heads; p. 42 illustr. 65 Lysiloma multifoliolatum B. & R.

- Fi. Pinnae usually less than 10 pairs; leaflets 4-7 mm long, 0.5-2 mm wide; petiole with a gland Fk.
- Fk. Legume 1-1.5 cm wide, puberulent; stipe 6-8 mm long; pinnae 5-10(-15) pairs; axis of leaves puberulent; p. 40 Leucaena diversifolia (Urban) B. & R.
- Fk. Legume 2.5-3 cm wide, on pedicel, not on stipe, blackish, glabrous; pinnae 9 pairs; leaflets short-pilose; axis of leaves velutinous-pilosulous; p. 41, illustr. 65 Lysiloma acapulcense (Kunth) Bth.
- Fe. Leaflets (7-)8-20(-25) mm long, 1-3 mm wide; axis of leaves bearing glands at least at upper nodes; spines none Fl.
- Fl. Pinnae 5-6 pairs; legume not on stipe; leaflets about 8 pairs, 10-25 mm long, acute, puberulent beneath; flowers in umbels; p. 51
- Pithecellobium nicoyanum (B. & R.) Niez. & Nevl.
- Fl. Pinnae 7-15 pairs Fm.
- Fm. Legume on stipe; leaflets pubescent above and beneath; legume 8-11 cm long, almost 2 cm wide, pubescent; gland between terminal pair of pinnae only; leaflets 10-25 pairs, 4-6 mm long, 1-2 mm wide; petiole 2-3 cm long, usually without a gland; p. 48
- Pithecellobium carbonarium (Britton) Niez. & Nevl.
- Fm. Legume unknown; leaflets glabrous, acute, 20-30 pairs, 8-12 mm long, 1 mm wide; p. 53
- Pithecellobium Tuerckheimii (B. & R.) St. & St.

ARTIFICIAL KEY TO SPECIES OF
MIMOSA IN NICARAGUA
OTHER COUNTRIES OF CENTRAL AMERICA

- A. Leaflets 4-40 mm wide, at least some leaflets 4 mm wide or wider B.
- B. Leaflets 1-4 pairs (2-8) or an odd number on a pinna; legume jointed C.
- C. Pinnae (1-)2-3 pairs, at least some leaves with more than 1 pair; twigs with abundant recurved prickles; petiole and axis of leaves with 1 or more glands; leaflets usually 3 pairs, upper ones 2-4 cm wide, obtuse or rounded at tip; woody vine D.
- D. Leaflets sparsely granular-resiniferous beneath; p. 46 Mimosa resinifera Britton
- D. Leaflets not granular-resiniferous; p. 46
- Mimosa Watsonii Robinson

C. Pinnae 1 pair E.

E. Leaflets 6-8 (3-4 pairs) on a pinna, 1-3 cm long, 5-15 mm wide, palmately veined at base; legume 3-4 cm long, 12 cm wide; p. 43 Mimosa Casta L.

E. Leaflets 3-4; lower leaflet(s) (1 or each pair) on same pinna much reduced; legume 1-3 cm long, 3-10 mm wide F.

F. Plant an erect shrub; leaflets very unsymmetrical, 2 pairs G.

G. Leaflets 1.5-3.5 cm long; branches glabrous or nearly so; legume unknown; p. 46 Mimosa sesquijugata D. S.

G. Leaflets 3-8 cm long, densely strigose; branches pubescent, usually densely, with few spines; floral bractlets no longer than puberulent buds, scarcely visible; p. 46 Mimosa albida H. & B.

F. Plant climbing or sprawling or prostrate H.

H. Valves of legume densely short-pilose, setose-spinulose on margins; leaflets glabrous above, 2 pairs, upper pair 3-4 cm long; legume 2-2.5 cm long, 6-8 mm wide; p. 44 Mimosa Maxonii Stan.

H. Valves of legume not pilose; margins and sometimes valves setose-spinulose; leaflets 2 pairs, appressed-setose or almost glabrous beneath I.

I. Branches densely or sparsely hirsute as well as with recurved spines; leaflets up to 2 cm long, 4-7 mm wide, strigose above and beneath; legume 1-1.5 cm long, 3-5 mm wide; p. 44. Mimosa panamensis (Bth.) Stan.

I. Branchlets glabrous or nearly so, with dense recurved prickles; leaflets 3-4 cm long, 10-15 mm wide, upper ones acute, glabrous above; legume 1-3 cm long, 8-10 mm wide; floral bractlets prominent, exceeding and obscuring subglabrous heads; p. 46. Mimosa Velloziana Mart.

B. Leaflets 4 to many pairs on a pinna, (3-)18 mm wide J.

J. Pinnae clustered at or near tip of petiole, 1-2 pairs; leaflets 4-9 pairs, glabrous above; stem or branches usually prickly; plant an herb or woody vine K.

K. Leaflets palmately veined at base, 5-15 mm wide, 3-4 pairs, 1-3 cm long; legume 3-4 cm long, 12 mm wide; p. 43 Mimosa Casta L.

K. Leaflets pinnately veined; pinnae 1-2 pairs; leaflets 4-8 pairs, 3-8 mm wide, ovate or oval or oblong; legume 1.5-2 cm long, 2-4-jointed L.

- L. Leaflets 7-9 mm long, 3-8 mm wide, glabrous above, setose-hispid beneath, rounded at tip; legume 1.5-2 cm long, 4 mm wide; valves glabrous, pilose or setose; p. 44, 46 Mimosa Skinneri Bth.
- L. Leaflets 8-9 mm long, 4 mm wide, much more densely hispid; valves of legume with stout stiff spines or hispid; p. 44, 46 . . . Mimosa germana Stan. & Wms.
- J. Pinnae remote, pairs 4-12 mm apart, 2-10 pairs; legume 2-8 cm long, 4-25 mm wide; leaflets 3-many pairs, 0.7-3 cm long; twigs with dense recurved wide-based prickles M.
- M. Legume not jointed, 2 cm long, 8-9 mm wide, densely setose, margins thick; leaflets 7-11 pairs, 14-19 mm long, 5-8 mm wide; p. 43 Mimosa canahuensis St. & St.
- M. Legume jointed, 6-10 cm long, glabrous or nearly so N.
- N. Glands of petiole and of axis of leaves large; leaflets densely hairy, largest ones 1-1.5 cm wide; pinnae 4-6 pairs; legume 1.5 cm wide, glabrous or nearly so in age, not red; p. 46 Mimosa Recordii B. & R.
- N. Glands of petiole and axis of leaves minute or none O.
- O. Petiole and axis of leaves without prickles; leaflets densely pilose above and beneath, 3-6 pairs, 1-2 cm long; pinnae 3-6 pairs; legume 3-5 cm long, velutinous-pilose, margins prickly or not; tree; p. 44, 45 Mimosa guatemalensis (Hook. & Arn.) Bth.
- O. Petiole and axis of leaves usually abundantly prickly; leaflets hairy beneath; legume glabrous, shiny; woody vine P.
- P. Pinnae 2-4 pairs; leaflets 6-9 pairs, 1-3 cm long, 1-1.5 cm wide, puberulent or almost glabrous above; legume up to 8 cm long, 1 cm wide, not on a stipe; p. 44, 58 Mimosa hondurana Britton
- P. Pinnae 3-10 pairs; leaflets about 15 pairs, 7-11 mm long, 2.5-5 mm wide, pilosulous above; legume about 6 cm long, 1.5 cm wide, on short stipe; p. 30, 46 Mimosa scalpens Stan.
- A. Leaflets 1-3(-3.5) mm wide, 4-many pairs on a pinna Q.
- Q. Legume winged, 4-7.5 cm long, 12-15 mm wide, on a stipe; wing serrate, often cleft; leaflets 6-7 mm long, 1-3.5 mm wide, widely rounded at tip, setulose or glabrate; pinnae 2-4 pairs; p. 44, illustr. 58 Mimosa hemiendytæ Rose & Robinson
- Q. Legume not winged or unknown R.
- R. Pinnae clustered at or near tip of petiole, 1-5 pairs S.
- S. Pinnae 3-5 pairs; leaflets 30-60 pairs, glabrous above; p. 45 Mimosa polydactyla H. & B.
- S. Pinnae 1-2 pairs T.

- T. Leaflets pilosulous or puberulent above, 8-12 mm long, 2.5-3.5 mm wide; pinnae 1 pair; peduncles up to 2 cm long, appressed-hairy; legume unknown; p. 44.
 Mimosa guanacastensis Stan.
- T. Leaflets glabrous or glabrate above; stem and branches usually prickly U.
- U. Plant a shrub or tree; peduncles 3-4.5 cm long; leaflets 2.5-3.5 mm wide; legume 3 cm long, 7 mm wide, hairy, narrowed between seeds; p. 46.
 Mimosa zacapana St. & St.
- U. Plant an herb; pinnae 1-2 pairs; legume not narrowed between seeds V.
- V. Legume 3-4.5 cm long, 4-5 mm wide; valves glabrous, margins densely spiny; legume 7-11-jointed; pinnae 1 pair; leaflets about 8 pairs, 10 mm long, 3 mm wide, glabrous; p. 45. . Mimosa pinetorum Stan.
- V. Legume 1-2 cm long, 2-5-jointed; pinnae 1-2 pairs; margins of valves densely spiny; spines stout, stiff, or hispid W.
- W. Leaflets 4-8 pairs, 8-9 mm long, 4 mm wide, hispid, ovate, oval or oblong; legume 1.4-2 cm long; p. 44, 46 . Mimosa germana Stan. & Wms.
- W. Leaflets 15-25 pairs, 5-10 mm long, 3 mm wide, oblong or linear-oblong; margins of valves with dense long setae; legume 1-1.5 cm long, 3 mm wide; p. 45, illustr. 58. . . . Mimosa pudica L.
- R. Pinnae remote, pairs 4-12 mm apart; legume 2-8 cm long, 4-15 mm wide; leaflets 5-many pairs; pinnae 2-15 pairs X.
- X. Twigs densely scaly; pinnae 5-7 pairs; leaflets 25-35 pairs, 1-1.5 mm wide; p. 43.
 Mimosa Bracaatinga Hoehne
- X. Twigs not scaly; leaflets 3-8 mm long Y.
- Y. Legume 0.8-10 cm long, 2-8 mm wide; branches with few or usually many prickles; leaflets 4-many pairs;
 Z. cp. p.
- Z. Stem sparingly if at all prickly; prickles, if any, straight or recurved; legume 4 mm wide, setose; leaflets 5-30 pairs, 1-2 mm wide, glabrous or ciliate; pinnae 1-6 pairs; the 2 next following species are doubtfully distinct Aa.
- Aa. Pinnae 1-3 pairs; leaflets 5-20 pairs, 1-1.5 mm wide; petiole less than 1 cm long; legume less than 1 cm long, 1-3-jointed; p. 45
 Mimosa pusilla Bth.

- Aa. Pinnae 2-6 pairs; leaflets 15-30 pairs, 1-2 mm wide, sparsely ciliate; legume 8-15 mm long, densely long-setose; p. 43. Mimosa flavescens Splitgerber
- Z. Stem usually with many prickles; leaflets 6-many pairs, 1 mm wide or narrower; axis of leaves with or without prickles; pinnae 2-8 pairs; leaflets glabrous or nearly so or pubescent, obtuse or rounded Ab.
- Ab. Leaflets 3-nerved at base, 9-13 pairs; plant a shrub; pinnae 4-5 pairs; valves of legume hispid, densely spinose-hispid on margins; p. 44 . . . Mimosa hadrocarpa Molina
- Ab. Leaflets not 3-nerved at base; pinnae 2-8 pairs; plant shrubby or herbaceous Ac.
- Ac. Leaflets 8-10 pairs, 8-12 mm long; legume 0.8 cm long, 3-4 mm wide, about 2-jointed; pinnae 2-3 pairs; plant annual; p. 46 Mimosa teledactyla D. S.
- Ac. Leaflets 6-many pairs, 2-8 mm long; pinnae 2-8 pairs; plants shrubby or chiefly herbaceous; branches usually with many prickles Ad.
- Ad. Stems terete or nearly so; leaflets 6-many pairs; petiole and axis of leaves with or without prickles Ae.
- Ae. Legume about 12 mm long, 8 mm wide, joints 2 or 3; pinnae 3-6 pairs; twigs with many straight prickles; plant a shrub; stem usually prostrate, with appressed hairs; p. 43
- Mimosa dormiens H. & B.
- Ae. Legume 4-7 cm long, 3-4 mm wide, joints many; pinnae 2-8 pairs; stems erect, shrubby, with long, spreading, gland-tipped hairs; p. 46 . . .
- Mimosa somnians H. & B.
- Ad. Stems conspicuously angled; leaflets many pairs, 1 mm wide; legume 1-2.5 cm long, 5-6 mm wide, pilose, prickly on valves and margins, 3-5-jointed; petiole and axis of leaves densely prickly; twigs with dense recurved prickles; p. 44 Mimosa invisa Mart.
- Y. Legume 3-10 cm long, 8-25 mm wide, or unknown; branches usually with many prickles; leaflets 4-many pairs Ae. cp. p.
- Ae. Axis of leaves (rachis) with prickles or setiform appendages; pinnae 3-15 pairs Af.
- Af. Legume densely brownish-hispid, 3-8 cm long, 10-12 mm wide; leaflets about 1 mm wide; pinnae 7-15 pairs; P. 37, 44, illustr. 58 Mimosa pigra L.
- Af. Legume glabrous or nearly so or puberulent, 5-6 cm long; leaflets 15-25 pairs; woody vine Ag.

- Ag. Legume 1 cm wide, on long stipe, attenuate to tip, not jointed, puberulent when young, margins and stipe spiny; pinnae 5-8 pairs; leaflets 1 mm wide; p. 19, 43. Mimosa Donnell-Smithii (B. & R.) St. & St.
- Ag. Legume 1.5 cm wide, on short stipe, rounded at tip, glabrous, margins sometimes spiny; pinnae 3-10 pairs; leaflets 7-11 mm long, 2.5-5 mm wide; p. 27, 46 Mimosa scalpens Stan.
- Ae. Axis of leaves without prickles; legume 3-9 cm long or unknown Ah.
- Ah. Leaflets 6-8 mm long, hairy when young, usually above and beneath, 10-15 pairs; legume unknown; p. 43
 Mimosa costaricensis Bth.
- Ah. Leaflets 3-6 mm long, glabrous or sparsely and minutely pilose or sometimes ciliate, many on a pinna; pinnae 6-10 pairs Ai.
- Ai. Legume 2-2.5 cm long, glandular-hairy, jointed; pinnae 6-9 pairs; leaflets 4-6 mm long; p. 43
 Mimosa Calderonii B. & R.
- Ai. Legume 3-6.5 cm long, glabrous, not jointed; branches prickly but almost glabrous; leaflets 3-5 mm long; pinnae 6-10 pairs; p. 19, 45 . Mimosa platycarpa Bth.

ANNOTATED LIST OF BIPINNATE LEGUMINOSAE IN NICARAGUA AND OTHER COUNTRIES OF CENTRAL AMERICA

Genera and species are arranged alphabetically.

Data supplied by Mr. Ray Angelo are followed by his name.

Acacia Allenii Janzen, Contr. Smithsonian Bot. 13: 53. 1974. Costa Rica (FLAS). Similar to Acacia melanoceras Beurl. according to Janzen, from which he separates it by A. Allenii having only 0-6 glands on the petiole. Description excerpted from Janzen, l. c. Pinnules (leaflets) 8-11 mm long, 2-3.5 mm wide up to 60 per pinna. Pinnae 7-10 cm long, up to 40 per leaf. Petiole with 2-10 widely spaced nectaries. Rachis with 1-2 nectaries at bases of pinnae. Swollen stipular thorns dark-brown, up to 4 cm long, 1 cm wide at base, external thorn walls with low and rounded longitudinal ridges, p. 53, l. c. Pinnules (10-)20-30-jugate, 5-10 mm long, 1-4 mm wide. Translation from the Latin mine.

Acacia angustissima (Miller) Kuntze, *Rev. Gen.* 3, pt. 2: 147, 1898. Synonyms: *Acaciella Rensonii* B. & R., *N. Amer. Fl.* 23: 101. 1928. *Acacia Pittieriana* Standley, *Field Mus. Bot.* 18: 489. 1937.

Petiole of mature leaves 2-4 cm long. Leaflets 1 mm wide. Angelo.

Mexico to middle South America, *Fl. Panama* 5: 269. 1950.

Nicaragua, Dept. Matagalpa, Santa Maria de Ostuma. Harri-
man 14795 (OSH, SEYM).

Acacia Baileyana F. Mueller, *Trans. & Proc. Roy. Soc. Vict.* 24: 168. 1888.

Pinnæ 2-3 pairs. Leaflets 12-15 pairs, 4-5 mm long, 0.5-1 mm wide. Petiole without a gland, very short, about 1 cm long or less. Axis of leaves glabrous. Leaves not sensitive. Legume 3.5-10 cm long, 12 mm wide, flat, glaucous, sometimes narrowed between seeds. L. H. Bailey, *Manual* 431. Racemes of heads 8-11 cm long, often drooping; racemes slender. Flowers yellow.

Florida (FLAS), Costa Rica.

Acacia centralis (Britton & Rose) Lundell, *Contr. Univ. Mich. Herb.* 4: 7. 1940.

One or two glands very close to tip of rachis; glands on petiole also, near middle. Leaflets 0.5 mm wide. Axis of leaves minutely but clearly pubescent. Angelo.

Guatemala, Salvador. Type coll. near San Salvador.

Acacia Collinsii Safford, *Science* II. 31: 677. 1910.

Synonym: *Acacia costaricensis* Schenck, *Repert. Sp. Nov.* 12: 361, 1913, according to Jensen. Type: Honduras, Dept. Santa Barbara, San Pedro de Sula. Thieme 5216 (Herb. Capt. John Donnell Smith).

Acacia panamensis Schenck, *Fedde Rep. Sp. Nov.* 12: 362. 1913.

Mexico, British Honduras, Guatemala, Honduras, Salvador.

Nicaragua, Costa Rica, Panama. Many localities in Nicaragua, according to Janzen.

Nicaragua, Dept. Leon, Rio Tamarinda. Neill N181 (MSC, SEYM).

Dept. Rivas, La Virgen. Nichols 1214 (ENAG, SEYM).

Acacia Cookii Safford, *Science* II. 31: 677. 1910.

Mexico, British Honduras, Guatemala. Leaflets less than 1 mm wide.

Acacia cornigera (L.) Willd., *Sp. Pl.* 4: 1080. 1806.

Synonyms: *Acacia spadicigera* Schlechtendal & Chamisso, *Linnaea* 5: 594, 1830.

Acacia nicoyensis Schenck in *Fedde Rep. Sp. Nov.* 12: 360.

1913. See Janzen, *Contr. Smithsonian Bot.* 13: 53. 1974.

See also Memoirs N. Y. Botanical Garden 25: #1: 26.

Pinnæ 2-8 pairs; leaflets 15-20 pairs on a pinna, 5-7 mm long, 1.5-2 mm wide. Petiole with a gland near summit; gland often on axis of leaves. Or leaflets 7-10.5 mm long, 2 mm wide.

Spines 2-8 cm long, hollow. Fieldiana Bot. 24: 10. 1946.

Legume 3-5 cm long, terete, with long spine-like beak.
Mexico, British Honduras, Guatemala, Honduras, Salvador,
Nicaragua, Costa Rica (FSU), Cuba.

Nicaragua, coll. Janzen: Depts. Esteli, Esteli; Matagalpa, Matagalpa; Dept. Leon, Leon; Rivas, Penas Blancas., l. c.

Dept. Masaya, Lake Masaya. Nichols 120 (ENAG, MO, SEYM).

Dept. Rivas, La Virgen. Nichols 1407 (ENAG, MO, SEYM).

Acacia dealbata Link, Enum. Hort. Berol. 445, 1821.

Leaflets about 0.5 mm wide. Flowers in a head.

Description in Bailey's Encyclopedia. Guatemala.

Acacia Deamii (Britton & Rose) Standley, Field. Mus. Bot. 11: 158, 1936. Leaflets 0.15-1.5 mm, mostly 1 mm wide.

Axis of leaves slightly pubescent. Stipe of legume 5-10 mm long. Angelo. Guatemala.

Acacia dolichostachya Blake, Biol. Sci. Wash. 34: 43, 1921.

Leaflets 0.75-1 mm wide. Angelo. Guatemala.

Acacia Donnelliana Safford, Journ. Wash. Acad. Sci. 4: 361. 1914. Type from Honduras. Reported from Guatemala in N. Amer.

Fl., but the locality is in Honduras, as reported in Fl. Guatemala, p. 28, under the name *Myrmecodendron Donnellianus* (Safford) Britton & Rose.

This species said to be much like *A. globulifera* but "easily distinguished by its dark-colored polished spines and much longer vegetative leaves". Journ. Wash. Acad. Sci. 4: 361. 1914.

Acacia Farnesiana (L.) Willd., Sp. Pl. 1083. 1806.

Leaflets 1 mm wide. Texas, La., Ga., Fla., Mexico, Panama (FLAS).

Nicaragua, Dept. Matagalpa, Calabazas. Seymour & Atwood 2584 (B, BM, DUKE, ENAG, F, FLAS, GH, HARTWICK, MICH, MO, NY, OSH, REED, SEYM, SMU, UC, WDP).

Dept. Boaco, Potrerillos. Seymour 2355 (BM, ENAG, F, GH, MO, SEYM, SMU).

Dept. Granada, Granada. Dudey 1099 (BM, ENAG, F, GH, SEYM, SMU).

Acacia Gentlei Standley, Field Mus. Bot. 22: 77, 1940.

Legumes flattened. Angelo.

British Honduras, Guatemala.

- Acacia globulifera Safford, Journ. Wash. Acad. Sci. 5:369. 1915.
Pinnae about 15 pairs. Leaflets 3-4 mm long. For description,
see N. Amer. Fl. 23, pt. 2, p. 93. 1928. Pinnae 2-5 pairs.
Leaflets 6-12 pairs on flowering branches. Spines ivory-white,
4-5 cm long. Fruit unknown., l. c.
- Acacia glomerosa Benthham, Lond. Journ. Bot. 1:521, 1842.
Leaflets 2-3 mm wide. Yucatan, British Honduras, Salvador
to Panama, Colombia to Brazil. Fl. Guatemala 5:10. 1946.
- Acacia Hayesii Benthham, Trans. Linn. Soc. 30:524. 1875.
Synonym: Acacia acanthophylla (Britton & Rose) Standley, Field
Mus. Bot. 18:488, 1937. Panama (GH).
Leaflets 2 mm wide Legume 8-10 mm long. Angelo.
- Acacia Hindsii Benthham in Hook. Lond. Journ. Bot. 1:504.
1842. Mexico, Guatemala, Honduras (FSU), Salvador,
Nicaragua, according to Janzen 116-118, 1974.
Nicaragua, Dept. Leon, Leon. Janzen.
Dept. Chinandega, Ameyá. Maxon, Harvey & Va-
lentine 7176 (US).
- Acacia hirtipes Safford, Journ. Wash. Acad. Sci. 4:367. 1914.
Guatemala.
- Acacia macracantha Humboldt & Bonpland ex Willd., Sp. Pl. 4:
1080, 1806. Leaflets scarcely 1 mm wide.
Florida, Antigua, Tortola, Dominica, Jamaica (FLAS).
- Acacia mayana Lundell, Carnegie Inst. Wash. Publ. 478:210,
1937. Mexico, Guatemala, Costa Rica (FLAS).
- Acacia melanoceras Beurl., Sv. Vet. Acad. Handl. 1854:123,
1856. Synonym: Acacia multiglandulosa Schenck, Repert.
Nov. Sp. Fedde 12:362, 1913.
Discussed in Journ. Wash. Acad. Sci. 5:357-358, 1915.
Glands on petiole 18-30. Cp. Acacia Allenii.
Panama. Safford 1915 "described A. melanoceras under the
name of A. multiglandulosa", according to Janzen p. 43.
- Acacia pennatula Schlechtendal & Chamisso) Benthham, Lond.
Journ. Bot. 1:390, 1842. Guatemala.
Nicaragua, Dept. Esteli, Bosque. Neill 7346 (MO, SEYM,
SMU, UCA).
Esteli. Neill 7187 (MO, SEYM,
SMU, UCA).
- Acacia polypodioides Standley, Contr. U. S. Nat. Herb. 20:184.
1919. Veins of leaflets similar to those in Acacia riparioides
which has prickles on the branches; spines none and
petiole without glands in A. polypodioides.
Guatemala. Nicaragua, Dept. Granada, Granada. Baker
2325 (GH).
- Acacia riparia HBK., Nov. Gen. & Sp. 6:276, 1824.
Leaflets about 1 mm wide. Jamaica (FLAS).

Acacia riparioides (Britton & Rose) Standley, Field Mus. Bot. 3: 277, 1930.

Yucatan, Salvador. As to veins of leaflets, cp. *Acacia poly-podioides*.

Acacia Ruddiae Janzen, Smithsonian Contr. Bot. 13: 1-131, 1974.

Acacia tenuifolia (L.) Willd., Sp. Pl. 4: 1091, 1806.

Leaflets less than 1 mm wide. Costa Rica, Panama.

Acacia tortuosa (L.) Willd., Sp. Pl. 4: 1083, 1806.

Gland of petiole generally at summit, more or less circular, raised and cup-like in Central America. In West Indies, gland more commonly near middle and elliptical. In some Central American specimens, I am unable to discern a gland on petiole. Leaflets 0.78-1.5 mm wide, mostly 1 mm. Angelo.

Spines at nodes.

Florida (FLAS), Mexico, Jamaica (FLAS).

Acacia villosa (Sw.) Willd., Sp. Pl. 4: 1067, 1806.

Synonym: *Acacia Oerstedii* (Britton & Rose) Standley, Field Mus. Bot. 18: 489, 1937.

Petiole and axis of leaves normally without glands. Leaflets 8-9 mm long, 1-4 mm wide. Angelo.

Adenanthera pavonina L., Sp. Pl. 384, 1753.

For description, see Little, E. L. & F. H. Wadsworth. Common Trees of Puerto Rico & the Virgin Islands 144, 1964, who report it as "very rare in Central America."

Leaflets 19-44 mm long, 10-22 mm wide.

Albizzia adinocephala (Donnell Smith) Britton & Rose, N. Amer. 23: 47, 1928. Leaflets 1-2 cm wide. Costa Rica, Panama.

Albizzia caribaea (Urban) Britton & Rose, N. Amer. Fl. 23: 44, 1928.

Leaflets 1-2 mm wide, varying from acute to obtuse. Legume narrowed gradually to base and stipe; stipe 4-8 mm long.

Angelo.

Nicaragua, Dept. Managua, Santa Clara. Neill 2882 (SEYM, UCA).

Albizzia Hummeliana Britton & Rose, Tropical Woods 8: 7, 1926.

Leaflets 3-4 mm wide. "I would say that the rachis lacked glands. However the places where leaflets have detached give the appearance of cupular glands that I have seen in other species of the family." Angelo.

British Honduras, Record (YU no. 8795); Winzerling; both 1926.

Type: 1,209,912 (US).

Albizzia idiopoda (Blake) Britton & Rose, N. Amer. Fl. 23: 44, 1928.

Leaflets 1.5-3 mm wide. Angelo. British Honduras, Guatemala.

Albizzia Lebbeck (L.) Bentham, Hook. Lond. Journ. Bot. 3:87, 1844.

"Leaves mostly bipinnate", Ann. Mo. Bot. Gard. 37:254, 1950.

Leaflets 1-2 mm wide. Florida, Puerto Rico (FLAS), Florida, Puerto Rico, British Honduras, Guatemala?

Albizzia longepedata (Pittier) Britton & Rose, N. Amer. Fl. 23: 46, 1928.

Synonyms: Pithecellobium longepedatum Pittier, Contr. U. S. Nat. Herb. 20: 464, 1922.

Pseudosamanea guachapele (HBK.) Harms, Notizbl. 11: 54, 1930.

For synonymy, see Phytologia 44: 378, 1979.

Guatemala, Salvador, Costa Rica, Panama, Colombia, Venezuela. Fl. Guatemala 5: 18, 1946.

Albizzia Lundellii Standley, Tropical Woods 52: 26, 1937.

Synonym: Ablizzia rubiginosa Standley, Carnegie Inst. Wash.

Publ. 461: 58, 1935, non Miquel 1855.

Leaflets about 1 mm wide. Angelo.

Albizzia tomentosa (Micheli) Standley, Journ. Wash. Acad. Sci. 13: 6, 1953. Leaflets (1-)2-6(-10) mm wide. Angelo.

Guatemala.

Caesalpinia affinis Hemsley, Diag. Pl. Mex. 8, 1878.

Leaflets (7) 11-13 mm wide. Angelo.

Type: Guatemala. Skinner.

Caesalpinia Bonduc (L.) Roxb., Hort. Beng. 32, 1814.

Florida (FLAS), Grand Cayman Island (FLAS), Guatemala.

Caesalpinia Conzattii (Rose) Standley, Trop. Woods 37: 34, 1934.

Leaflets 9-10 mm wide. Angelo. Guatemala.

Caesalpinia coriaria (Jacq.) Willd., Sp. Pl. 2: 532, 1799.

Synonym: Poinciana coriaria Jacq., Del. Stirp. Amer. 123, 1763.

Pinnæ about 4-15. Leaflets up to 2 mm wide.

Caesalpinia Crista L., Sp. Pl. 380, 1753.

Leaflets 1-2.5 cm wide.

Florida (FLAS), Mexico (FLAS), Guatemala, Costa Rica, Panama. Nicaragua, Dept. Managua, Masachapa. Nichols 1370 (ENAG, GH, MO, SEYM, SMU).

Caesalpinia eriostachys Bentham, Bot. Voy. Sulphur 88, 1844.

Leaflets 3-5 mm wide.

Guatemala, Costa Rica, Panama (FLAS).

Caesalpinia exostemma DC., Prodr. 2: 483, 1825.

Leaflets 5-15 mm wide. Angelo. Mexico, Guatemala (FLAS).

Caesalpinia Gaumeri Greenman, Field Mus. Bot. 2: 330, 1912.

Pinnæ 4-9 per leaf. Leaflets 7-12, not paired, 7-15 mm wide.

Angelo. Guatemala.

Caesalpinia pulcherrima (L.) Swartz, Obs. Bot. 166, 1791.

Leaflets 5-10 mm wide.

Florida (FLAS), Mexico, British Honduras to Salvador and Panama (FLAS, FSU), Jamaica, Mariana Islands, Tinian (FLAS).

Nicaragua, Dept. Matagalpa, Sebaco. Atwood 2472 (GH, MO, SEYM); Mena 2510 (SEYM).

Dept. Managua, Managua. Zelaya 2250 (B, ENAG, F, FLAS, GH, MO, MSU, NY, REED, SEYM, SMU, UC, YU).

Dept. Masaya, Lake Masaya. Dudey 57 (B, BM, F, FLAS, GH, MICH, MO, NY, SMU, TEX, UC, VT, WDP).

Dept. Carazo, Santa Teresa. Atwood 1278 (ENAG, GH, MO, SEYM, SMU).

Caesalpinia Recordii Britton & Rose in Standley Trop. Woods 7: 6, 1926. Leaflets 12-16 mm wide. Angelo. Guatemala.

Caesalpinia urophylla (Donnell Smith) Standley, Field Mus. Bot. 18: 513, 1937. Costa Rica.

Caesalpinia velutina (Britton & Rose) Standley, Tropical Woods 34: 40, 1933.

Leaflets 2-2.5 cm wide. Angelo. Guatemala.

Caesalpinia vesicaria L., Sp. Pl. 381 1753.

Leaflets 1-3 cm wide. Angelo. Petiolules about 2-3 mm long. Guatemala, Cuba (FLAS).

Caesalpinia violacea (Miller) Standley, Carnegie Inst. Wash. Publ. 461, 1935.

Pinnae 2-6 pairs. Leaflets 4-8 pairs, ovate-oblong, 2-5 cm long, obtuse or acute, often puberulent. Legume 6-10 cm long, 2.5-3 cm wide, glabrous or nearly so, rounded at tip, on short stipe. Fl. Cuba 2: 80, 1951. Translation mine. Guatemala.

Caesalpinia yucatanensis Greenman, Field Mus. Bot. 2: 252. 1907. Leaflets 6-17 mm wide. Angelo. Guatemala.

Calliandra belizensis (Britton & Rose) Standley, Field Mus. Bot. 4: 309, 1929.

Leaflets 8-12 mm long, linear-oblong. Guatemala.

Calliandra Brenezii Standley, Field Mus. Bot. 18: 491, 1937. Costa Rica.

Calliandra Caeciliae Harms, Repert Sp. Nov. 17: 89, 1921. Leaflets about 1 mm wide. Guatemala.

Calliandra capillata Benthham, Lond. Journ. Bot. 3: 98, 1844. Leaflets 1-2 cm long, 6-27 mm wide, widely oblong to widely

obovate. Mexico, British Honduras, Guatemala, Salvador.

Calliandra caracasana (Jacq.) Benth in Trans. Linn. Soc. 30: 543, 1875.

Leaflets about 1 mm wide.

Fl. Guatemala p. 26 states that this species is South American, scarcely distinguishable from Calliandra portoricensis, but Fl. Panama lists Calliandra porotricensis Benth with a question mark as a synonym of Calliandra caracasana.

Calliandra carcerea Standley & Steyermark, Field Mus. Bot. 23: 161, 1944.

Leaflets mostly 4-8 mm wide. Guatemala.

Calliandra confusa Sprague & Riley, Kew Bull. 371, 1923.

Synonym: Calliandra similis Sprague & Riley, Kew Bull. Misc. Inf. 371, 1923.

Leaflets 3-10 mm long, 1 mm wide, almost always 0.5-1.5 mm wide, a few specimens 2-3 mm wide. Angelo.

British Honduras, Guatemala, Costa Rica, Panama.

Calliandra costaricensis (Britton & Rose) Standley, Field Mus. Bot. 18: 492, 1937.

For description, see N. Amer. Fl. 23: 67, 1928.

Petiole 5-6 cm long. Legume only 3 mm wide, glabrous, very elastic, coiled in age, about 8 cm long. Costa Rica.

Calliandra Cumingii Benth in Hook. Journ. Bot. 2: 140, 1840.

Leaflets 11-20 pairs on a pinna, 1-2 mm wide. Legume more or less pilose (even wooly on occasion). Angelo.

Panama, Cuming 1248. Possibly Mexico and Venezuela and Colombia.

Calliandra emarginata (Humboldt & Bonpland) Benth, Lond. Journ. Bot. 3: 95, 1844.

Leaflets 8-27(-40) mm wide. Angelo. Scarcely separable from C. tergemina Benth according to Fl. Guatemala, p. 23. Florida (FLAS), Guatemala.

Calliandra glaberrima (Benth) Britton & Killip, Ann. N. Y. Acad. Sci. 35: 134, 1936. Panama.

Calliandra grandiflora (L'Her.) Benth, Hook. Journ. Bot. 2: 139, 1840.

In habit similar to Mimosa pigra L. but without thorns. Leaflets about 1 mm wide. Angelo.

Mexico (FLAS), Guatemala.

Nicaragua, Dept. Chontales, Santo Tomas. Atwood 2726 (SEYM).

Calliandra Houstoniana (Miller) Standley, Contr. U. S. Nat.

Herb. 23: 386, 1922. Leaflets 0.75-2 mm wide. Angelo.

Mexico, Guatemala, Honduras.

Managua, Dept. Nueva Segovia, Dipilto. Budier 6351 (GH, MO, SEYM, SMU).

Nicaragua, Dept. Nueva Segovia, Jalapa. Atwood, Marshall & Neill 6818 (SEYM).

Dept. Esteli, Cerro Santa Rosa. Seymour 7628b (SEYM); Hall & Bockus 7610 (SEYM); Nelson 7621a (SEYM, UCA).

Calliandra Magdalenae (Bert.) Bentham, Lond. Journ. Bot. 5: 102, 1846.

Synonym: Acacia Magdalenae Bert., ex DC. Prodr. 2: 455. 1825.

Calliandra Tonduzii (Britton & Rose) Standley, Field Mus. Bot. 4: 309, 1929.

Fl. Guatemala p. 27 treats Calliandra Tonduzii as a distinct species, whereas Fl. Panama Part 5, fasc. 2 p. 259, 1950 treats them as synonyms.

Leaflets 3 mm wide.

Calliandra mexicana Brandegee, Univ. Calif. Publ. Bot. 10: 183, 1922.

Leaflets 8-17 mm wide. Angelo.

Yucatan, Guatemala.

Nicaragua, Dept. Jinotega, San Rafael del Norte. Atwood A264 (MSC, SEYM).

Calliandra Molinae Standley, Ceiba 1: 39, 1950.

Pinnae 3 pairs, 3-6 cm long; leaflets commonly 9-14 pairs on a pinna, sessile, oblong-oval, 5-9 mm long, tip rounded, base, obliquely subtruncate, above minutely hirtellous or soon glabrous and whitish-papillose, ciliate, beneath spreading-pilose. Flowers in dense heads. Legume not described. Ceiba 1: 39, 1950. Honduras.

Calliandra mollis Standley, Contr. U. S. Nat. Herb. 17: 431, 1914.

No glands evident on petioles. Leaflets (largest) mostly 3 mm wide or 1-2 mm wide. Angelo. Petiole not described, l. c. Legume about 8 cm long, 6 or 7 mm wide, rounded-obtuse, short-beaked, attenuate to base, densely pilose, about 8-seeded, l. c.

Costa Rica, Nicoya. Tonduz 13536 (US), type.

Calliandra pallida (Britton & Rose) Standley, Field Mus. Bot. 18: 492, 1937.

Synonym: Anneslia pallida Britton & Rose, N. Amer. Fl. 23: 65, 1928.

"Pinnae 2-4 pairs; leaflets 14-16 pairs, narrowly oblong, 4-6 mm long, acute, glabrous, ciliate, pale and reticulate beneath" Legume not mentioned., l. c. Costa Rica.

Calliandra penduliflora Rose, Contr. U. S. Nat. Herb. 5: 193, 1899.

Leaflets 3-5-nerved at base, 4-6 pairs, very unequal and very oblique at base, 4-30 mm wide, typically 10-20 mm wide. An-

oblique at base, 4-30 mm wide, typically 10-20 mm wide. Angelo. Largest leaflets 4-5 cm long, rounded at tip, pubescent both sides. l. c.

Calliandra Pittieri Standley, Contr. U. S. Nat. Herb. 18: 104, 1916.

Leaflets less than 1 mm wide. Panama, Colombia.

Calliandra portoricensis (Jacq.) Benth. Journ. Bot. 3: 99, 1844. See note under Calliandra caracasana.

Leaflets 1-3 (4) mm wide. Angelo.

S. Mexico, British Honduras, Salvador to Costa Rica and Panama, Costa Rica (FSU), British Virgin Islands, Tortola (FLAS), Jamaica.

Calliandra Quetzal Donnell Smith, Enum. Pl. Guat. 8: 36, 1907. Largest leaflets 1.8-2.2 mm wide. Guatemala.

Calliandra rhodocephala Donnell Smith, Bot. Gaz. 49: 454, 1910. Type: puerto Barrios, Izabal. C. C. Deam 6015.

Leaflets 1.5-4.5 cm wide, glabrous above and beneath. Angelo. Nicaragua, Dept. Zelaya, Madregara. Narvaez 3059 (ENAG, GH, MO, SEYM, SMU).

Calliandra Seemannii Benth. Voy. Herald 116, pl. 22, 1853. Leaflets 1-1.5 cm wide. Costa Rica, Panama.

Calliandra tapirosum Standley, Ceiba 1: 40, 1950.

Pinnae 3-5 pairs. Leaflets 8-16 pairs, oblong, about 6 mm long, 2 mm wide, obtuse and apiculate. Legume 4-angled, 7-9 cm long, about 8 mm wide, moderately densely hispidulo-tomentose. l. c.

Calliandra tetragona (Wild.) Benth. Hook. Journ. Bot. 2: 139, 1840. S. Mexico, British Honduras, Honduras,

Costa Rica, NW South America. Leaflets about 1 mm wide.

Calliandra Wendlandii Benth. Trans. Linn. Soc. 30: 556, 1875. Known from original collection only.

Perhaps a synonym of Calliandra emarginata (Humboldt & Bonpland) Benth. See comment in Fl. Guatemala p. 259.

Delonix regia (Bojer) Raf., Fl. Tell. 2: 292, 1836. Poinciana. Leaflets 3-4 mm wide.

Florida (FLAS), Mexico (FLAS), Jamaica (FLAS), Mariana Islands, Tinian (FLAS).

Nicaragua, Dept. Managua, Managua. Zelaya 2258 (B, DUKE, FLAS, SEYM, YU); Robbins 6090 (DUKE, FLAS, REED, SEYM, US); Seymour 6283a (SEYM).

Desmanthus virgatus (L.) Willd., Sp. Pl. 4: 1047, 1806. Leaflets 1-2 mm wide.

a. Erect shrub; gland of petiole large var. virgatus

z. Prostrate herb; gland of petiole small
 var. depressus (Willd.) Turner

- Var. depressus (Humboldt & Bonpland ex Willd.) B. L. Turner Field & Lab. 18: 61, 1950. Synonym: Desmanthus depressus Humboldt & Bonpland ex Willd., Sp. Pl. 4: 1046, 1806. Adams, C. D. Flowering Plants of Jamaica, 1972, treats Desmanthus depressus as a distinct species. Florida, British Virgin Islands, Tortola, Jamaica, Panama (FLAS).
- Var. virgatus. Similar in habit to Schrankia, but without prickles, whereas Schrankia bears abundant fine prickles. Florida, Mexico, Jamaica, Dominica, E. Caicos (FLAS), Panama (FSU).
- Entada gigas (L.) Fawcett & Rendle, Fl. Jamaica 4: 124, 1920. See Fl. Panama, Ann. Mo. Bot. Gard. 37: 310, 1950. Leaflets 3 cm wide. Central America, N. South America, West Indies, West Africa, Philippine Islands (FLAS).
- Entada patens (Hooker & Arnold) Standley, Contr. U. S. Nat. Herb. 23: 349, 1922. Leaflets 4-40 mm wide, mostly 10-25 mm wide. Angelo. Mexico, Salvador, Nicaragua.
- Entada polystachia (L.) DC., Mem. Leg. 434, 1825. Synonym: Mimosa polystachia L., Sp. Pl. 520, 1753. Mexico, Guatemala (FLAS, FSU), Jamaica. Nicaragua, Dept. Chinandega, Potosi. Marshall & Neill 6611 (SEYM); Neill 6616 (ENAG, GH, MO, SEYM). Leaflets 5-18 mm wide. Valves jointed, in age falling from persistent margins. (FLAS).
- Enterolobium cyclocarpum (Jacq.) Griseb., Fl. Brit. W. Ind. 226, 1860. Leaflets 2-4 mm wide. Angelo. Fruit called "Ears". Florida, Mexico, Costa Rica. Nicaragua, Dept. Chinandega, Potosi. Fruit floating in a brook, near warm spring. Seymour 7113, 24 Apr. 1975. Specimens lost.
- Enterolobium Schomburgkii Benthams, Trans. Linn. Soc. 30: 599, 1875. Leaflets 2-4 mm long, about 0.5 mm wide. Angelo. Mexico, Guatemala, Panama, Guianas, Brazil.
- Leucaena brachycarpa Urban, Symb. Antill. 2: 265, 1900. Leaflets 0.5-1 mm wide. Angelo. Guatemala.
- Leucaena diversifolia (Schlechtendal) Benthams, Hooker, Journ. Bot. 4: 417, 1842. Leaflets 0.5-2 mm wide. Angelo. Guatemala.
- Leucaena guatemalensis Britton & Rose, N. Amer. Fl. 23: 126, 1928. Leaflets 0.5-1.5 mm wide. Angelo. Florida (FLAS), Guatemala.

Leucaena latisiliqua (L.) Gillis, Taxon 23: 190, 1974.

Mimosa glauca L., Sp. Pl. ed. 2: 1504, 1763; non Sp. Pl. 520, 1753.

Acacia glauca (L.) Moench, Meth. Pl. 1794.

Leucaena glauca (L.) Bentham, Hooker, Journ. Bot. 4: 416,

Leucaena leucocephala (Lam.) de Witt, Taxon 10: 64, 1961.

The distinctions by which deWitt differentiates Leucaena glauca and Leucaena leucocephala are almost entirely differences in size.

Leaflets 8-15 mm long, 2-3 mm wide, acute. Legume cross-striate. Legume 5-9 cm long, 5-20 mm wide; seeds 1-8.

British Honduras (FSU), Guatemala, as Leucaena glauca.

Nicaragua, Dept. Boaco, Boaco. Atwood 5404 (BM, ENAG, FLAS, GH, MO, NY, SEYM, SMU, UC).

Dept. Managua, Managua. Zelaya 2266 (SEYM):
Atwood 2550 (SEYM).

Leucaena multicapitula Schery, Ann. Mo. Bot. Gard. 37: 302, 1950. Leaflets 7-25 mm wide. Panama.

Leucaena Shannonii Donnell Smith, Bot. Gaz. 57: 419, 1914.

Type from Salvador, Cojutepeque.

Leaflets 12-22 mm long; 4-9 mm wide. Angelo.

Nicaragua, Dept. Zelaya, Bluefields, El Bluff. Hamblett 614 (MO, SEYM).

Dept. Matagalpa, Matagalpa. Zelaya 2313 (ENAG, SEYM).

Dept. Boaco, Camoapa. Seymour 3528 (GH, MO, SEYM).

Dept. Chontales, Juigalpa. Neill 7284 (GH, MO, SEYM, SMU, UCA).

Lysiloma acapulcense (Kunth) Bentham, Lond. Journ. Bot. 3: 83, 1844.

Stipe 5-7 mm long. Angelo. Guatemala.

Lysiloma auritum (Schlechtendal) Bentham, Lond. Journ. Bot. 3: 83, 1844.

Axis of leaves densely pubescent, 6-14 cm long, typically 10 cm long. Angelo. Guatemala.

Lysiloma bahamense Bentham, Lond. Journ. Bot. 3: 82, 1844.

Leaflets 8-12(-15) mm long, 2-4 mm wide. Cp. Leucaena Shannonii.

Florida, Bahama Islands (FLAS), Photo of type in Taxon 23: 189, 1974.

Nicaragua, Dept. Leon, Volcan Momotombo. Neill 7814 (FLAS, GH, MO, SEYM, SMU, UCA).

Lysiloma desmostachys Bentham, Lond. Journ. Bot. 3: 84, 1844.

Stipe must be carefully distinguished from pedicel. A stipe is above calyx; a pedicel is below calyx.

Mexico, British Honduras, Salvador, Nicaragua.

Nicaragua, Dept. Leon, Volcan Momotombo. Neill 7333 (BM, GH, MO, NY, SEYM, SMU, UCA).

Dept. Managua, Apoyeque. Marshall & Neill 6698 (ENAG, MO, SEYM).

Esquipulas. Hall & Bockus 7981 (B, BM, FLAS, GH, MO, NY, OSH, REED, SEYM, SMU, TEX, UCA).

Lysiloma Kellermanii Britton & Rose, N. Amer. Fl. 23: 81, 1928. Leaflets 3-5 mm long. Guatemala.

Lysiloma multifoliolatum Britton & Rose, N. Amer. Fl. 23: 84, 1928.

Stipules large, 1-1.7 cm long, lanceolate, falling early, very distinctive, often present on sterile specimens, conspicuous. Flowers in heads. Similar to Lysiloma desmostachys, which has flowers in spikes. For sterile specimens, the best distinction is pinnae 15-25 pairs in L. multifoliolatum; 7-15 pairs in L. desmostachys.

Honduras (FSU).

Nicaragua, Dept. Esteli, Cerro Quiabu. Neill 7757 (BM, FLAS, GH, MO, NY, SEYM, SMU, UCA).

El Bosque. Neill 7346 (MO, SEYM, SMU, UCA): may belong here.

E. of Esteli. Neill 7187 (MO, SEYM, SMU, UCA).

Mechapa. Dudgey 1023 (B, BM, FLAS, MSC, MO, NY, SEYM, SMU, UC, UCA).

Lysiloma Seemannii Britton & Rose, N. Amer. Fl. 23: 182. 1928. Known from type locality only.

Costa Rica, Bot. Voy. Sulphur, pl. 31, 1844.

Mimosa albida Humboldt & Bonpland ex Willd., Sp. Pl. 4: 1030, 1806.

Mimosa albida is easily mistaken for a Pithecellobium, but the strigose lower surface of the leaflets in M. albida is very characteristic and so are the stout recurved prickles of the branches. The larger leaflets are 11-16 mm wide; those toward the ends of the branches are smaller. Reduced lower inner leaflets are 10-11 mm long. The distinctions between the following varieties are not sharp; they intergrade. The Flora of Panama treats these varieties as synonyms of Mimosa albida.

a. Leaflets densely setose-strigose above and beneath
 var. strigosa (Willd.) Robinson
 a. Leaflets almost glabrous above b.

b. Leaflets covered beneath with setae; branches densely hairy; corolla puberulent or tomentulose
 var. floribunda (Willd.) Robinson

b. Leaflets sparsely setose beneath; branches almost glabrous; corolla glabrous var. glabrior Robinson

Mimosa albida var. indet. British Honduras (FSU).

Mimosa albida var. floribunda (Willd.) Robinson, Proc. Amer. Acad. 33: 311. 1898. Nicaragua, Dept. Jinotega, Miraflores, Neill 7201 (SEYM, UCA).

Dept. Nueva Segovia, Cerro Mogoton. Atwood & Neill AN16 (MSC, SEYM).

Dept. Esteli, Cerro Santa Rosa. Nelson 7619b (OSH, REED, SEYM, TEX, UCA).

Mimosa albida var. glabrior Robinson, Proc. Amer. Acad. 33: 311. 1898. Nicaragua, Dept. Boaco, Camoapa. Seymour 3482 (MO, SEYM), 3527 (SEYM).
 Dept. Carazo, Casa Colorada. Seymour 555 (MO, SEYM).

Mimosa albida var. strigosa (Willd.) Robinson, Proc. Amer. Acad. 33: 311. 1898. Nicaragua, Dept. Leon, Telica. Dudgey, Hamblett & Nichols 200 (SEYM).
 Mexico (FLAS); British Honduras (FSU); Honduras (FSU).

Mimosa Bracaatinga Hoehne, A Bracaatinga ou Abracaatinga 23: ill. 1930.

Leaflets 4-6 mm long, 1-1.5 mm wide. Angelo. Guatemala.
Mimosa Calderonii Britton & Rose, N. Amer. Fl. 23: 167. 1928.
 Type: El Salvador, El Angel, Calderon 1842.

Leaflets 4-6 mm long. Costa Rica.
Mimosa canahuensis Standley & Steyermark, Field Mus. Bot. 23: 163. 1944. Known from the type only, Guatemala, El Progreso, Mountain Canahui, Steyermark 43758.

Leaflets 5-8 mm wide.

Mimosa Casta L., Sp. Pl. 518, 1753.

Leaflets 5-15 mm wide. Panama.

Mimosa costaricensis Benthham, Trans. Linn. Soc. 30: 423, 1875. Leaflets 6-8 mm long. Costa Rica.

Mimosa Donnell-Smithii (Britton & Rose) Standley & Steyermark, Field Mus. Bot. 23: 163, 1944. Leaflets 1 mm wide. Guatemala.

Mimosa dormiens Humboldt & Bonpland ex Willd., Sp. Pl. 4: 1035, 1806. Leaflets 1 mm wide. Costa Rica.

Mimosa flavescens Splitgerber in Hoev. & Vries Tijdschr 9: 110, 1842.

Sparingly short-prickly or without prickles. Petiole and axis of leaves bristly with occasional prickles, glabrous aside from sparse marginal setae. Glands none. Leaflets 1-2 mm wide.

Angelo. Mexico to the Guianas, Fl. Costa Rica 502, 1937, but not included in Fl. Panama.

Mimosa germana Standley & Williams, Ceiba 1: 240, 1951.

Similar to Mimosa Skinneri. Leaflets 8-9 mm long, 4 mm wide. Costa Rica.

Mimosa guanacastensis Standley, Field Mus. Bot. 18: 502, 1937. Leaflets 4-9 pairs on a pinna, 8-12 mm long, 2.5-3.5 mm wide. Costa Rica.

Mimosa guatemalensis (Hooker & Arnold) Benthams, Bot. Voy.

Sulphur 89, 1814. Type from Nicaragua, Realejo, according to Fl. Guatemala, p. 57, 1946.

Leaflets 4-18 mm wide.

Mimosa hadrocarpa Molina, Ceiba 1: 256, 1951. We have seen no specimens of this species. Costa Rica, l. c.

Mimosa hemiendyta Rose & Robinson ex Rose, Contr. U. S. Nat. Herb. 8: 32, 1903.

Leaflets 1-3.5 mm wide. Legume 7-8-jointed. Angelo. Guatemala, British Honduras (FSU).

Mimosa hondurana Britton, N. Amer. Fl. 23: 169, 1928.

Largest leaflets 1-1.5 cm wide. Angelo.

Guatemala; Honduras, Dept. Colon. Nelson & Martinez 1256. (FSU).

Mimosa invisa Mart., Flora 20 Beibl. 2: 121, 1837.

Leaflets 1 mm wide. Petiole 3.5-7 cm long. Axis of leaves 2.5-5 cm long. Pairs of pinnae 4-12 mm apart. Angelo. S. Mexico to Panama.

Mimosa Maxonii Standley, Contr. U. S. Nat. Herb. 17: 432, 1914. Type: Guatemala, vicinity of Mazatenango. Coll. Maxon & May 3497 (US).

Mimosa panamensis (Benthams) Standley, Contr. U. S. Nat. Herb. 18: 104, 1916.

Terminal leaflets 4-7 mm wide. Costa Rica, Panama.

Mimosa pigra L., Cent. Pl. 1: 13, 1755.

Leaflets 0.7-1 mm wide. Florida, Mexico, Jamaica, Puerto Rico, Paraguay (FLAS). British Honduras, Honduras. Costa Rica (FSU).

Nicaragua, Dept. Nueva Segovia, Jalapa. Atwood, Marshall & Neill 6818 (SEYM).

Dept. Boaco, Camoapa. Seymour 3526 (GH, MO, (SEYM).

Dept. Rio San Juan, San Bartolo. Seymour 6150 (SEYM).

Dept. Granada, Tipitapa. Neill 2664 (SEYM, UCA). Vera Cruz. Hall & Bockus 7831 (BM, FLAS, GH, MO, NY, REED, SEYM, SMU, UC, UCA).

Mimosa pinetorum Standley, Field Mus. Bot. 11: 131, 1932.
Leaflets 3 mm wide. Guatemala.

Mimosa platycarpa Benthham, Trans. Linn. Soc. 30: 417, 1875.
Leaflets 0.5-1 mm wide. Angelo. Guatemala.

Nicaragua, Dept. Esteli, Esteli. Neill 7218 (SEYM, UCA).

Mimosa platycarpa and M. guatemalensis are the only species
in this genus in Fl. Guatemalensis which have flowers in spikes.

Mimosa polydactyla Humboldt & Bonpland ex Willd., Sp. Pl. 4:
1033, 1806.

Leaflets 4-9 mm long, 1-2 mm wide. Thorns wide-based,
black-tipped. Legume 4 mm wide. Panama to Brazil.

Mimosa pudica L., Sp. Pl. 518, 1753.

Leaflets 1-2 mm wide. Pubescence varies greatly.

Florida, Antiqua, Bahama Islands, Jamaica, Trinidad (FLAS).

Honduras (FSU, SEYM). Costa Rica (FSU).

Nicaragua, Dept. Zelaya, Bluefields. Zelaya 431 ((ENAG, GH,
SMU); Marshall 6545 (FLAS, US); Seymour 704
(SEYM); El Bluff, Hamblett 617 (ENAG, GH,
MO, SEYM)

Comarca del Cabo, Waspan. Nelson 4860
(ENAG, MO, SEYM).

Puerto Cabezas. Marshall & Neill 6565 (B,
BM, DUKE, ENAG, F, FLAS, NY, REED,
SEYM, UC, US), 6557a (SEYM).

Dept. Nueva Segovia, Dipilto. Seymour 6373 (SEYM).

Dept. Boaco, Teustepe. Seymour 2425 (SEYM).

Dept. Chontales, Cuapa. Marshall & Neill 6666 (MO, SEYM).
Juigalpa. Nichols 1636 (SEYM).

Dept. Rio San Juan, San Carlos. Nelson 5334 (SEYM).

Dept. Chinandega, El Viejo. Seymour 2665 (GH, MO,
SEYM).

Dept. Leon, Aranjuez. Hall & Bockus 7961 (SEYM, UCA).
Telica. Dudey, Hamblett & Nichols 212
(SEYM), 213 (SEYM).

Dept. Managua, Masachapa. Nichols 910 (MO, SEYM).

Dept. Masaya, La Concepcion. Nichols 916 (SEYM).

Dept. Carazo, Casa Colorada. Dudey 510 (BM, ENAG,
F, GH, MO, NY, SMU, UC); Seymour 556 (SEYM).
Santa Teresa. Nichols 1310 (SEYM).

Mimosa pusilla Benthham, Bot. Voy. Sulphur 90, 1844.

Leaflets 1-1.5 mm wide. Prickles not only at nodes; some spe-
cimens are relatively spineless or only bristly on parts of some
stems. Angelo.

Nicaragua, Dept. Masaya, Parque Nacional Volcan Masaya.
Neill 2805 (SEYM, UCA).

Mimosa Recordii Britton & Rose, N. Amer. Fl. 23: 170, 1928.
Type: British Honduras, Stann Creek District, Middlesex. S. J.
Record.

Leaflets little more than 1 cm wide; largest leaflets 1-1.5 cm wide. Angelo.

Mimosa resinifera Britton, N. Amer. Fl. 23: 169, 1928.

Leaflets mostly 2-4 cm wide; largest leaflets 2.5-4 cm wide.
Angelo. Guatemala.

Mimosa scalpens Standley, Carnegie Inst. Wash. Publ. 461:58.
1935.

Branches terete to conspicuously 4-5-angulate.

Guatemala, Honduras, Telson & Clewell 0521 (FSU).

Mimosa sesquijugata Donnell Smith, Bot. Gaz. 13: 74, 1888.

Type: Guatemala, Santa Rosa. Tuerckheim 1327.

Mimosa Skinneri Bentham, Lond. Journ. Bot. 5: 85, 1846.

Leaflets 3-6 mm wide. Peduncles 8-45 mm long. Angelo.

Very similar to Mimosa germana.

Type: Guatemala, Costa de Leon, Baja Verapaz (?). Skinner.

Nicaragua, Dept. Nueva Segovia, Dipilto. Seymour 6376.
(SEYM).

Mimosa somnians Humboldt & Bonpland ex Willd, Sp. Pl. 4:
1036, 1806. Leaflets less than 1 mm wide.

Mexico to Paraguay, Fl. Costa Rica 504, 1937.

Mimosa teledactyla Donnell Smith, Bot. Gaz. 56: 57, 1913.

Leaflets 0.5-1 mm wide. Angelo. Guatemala.

Mimosa Velloziana Mart., Herb. Fl. Bras. 185, 1837.

Leaflets 10-15 mm wide. Similar to Mimosa albida.

Costa Rica, Panama.

Mimosa Watsonii Robinson, Proc. Amer. Acad. 36: 473, 1901.

Type: probably Costa Rica, Izabal. Sereno Watson 185323.
Costa Rica.

Leaflets 1-4 cm wide. Angelo. Leaflets mostly 20-35 mm wide.

Mimosa zacapana Standley & Steyermark, Field Mus. Bot. 23:

57, 1944. Type: Guatemala, near Santa Rosalia. Steyer-
mark 29018. Leaflets 2.5-3.5 mm wide.

Neptunia plena (L.) Bentham, in Hooker Journ. Bot. 4: 355,
1841. Leaflets 1-2 mm wide.

Mexico, Guatemala, Panama, W. I., Colombia to Brazil.

Neptunia prostrata (Lam.) Baill., Bull. Soc. Linn.

Paris 1: 356, 1883. Leaflets 1-3 mm wide.

Mexico, Guatemala, Panama, W. I., Colombia, Peru, Brazil;
tropics is eastern hemisphere.

Neptunia pubescens Bentham, Hooker Journ. Bot. 4: 356, 1842.

Leaflets 1-2 mm wide. Louisiana, Mississippi, Mexico
(FLAS), Panama.

Parkinsonia aculeata L., Sp. Pl. 375, 1753.

Leaflets up to 2 mm wide.

Texas, South Carolina, Florida, Tortola, Cuba, Jamaica (FLAS),
Panama, N. South America.

Peltophorum inerme (Roxb.) Naves ex Villar in Blanco, Fl.

Filip. Nov. App. 69, t. 335, 1880.

Leaflets 6 mm wide.

Florida (FLAS), Costa Rica?, Panama.

Pentaclethra macroloba (Willd.) Kuntze, Rev. Gen. 1: 201,
1891.

Pinnæ 2 pairs, 20-40 cm long. Leaflets 10-75 pairs, 6 mm
wide. Mexico, Guatemala.

Piptadenia constricta (Micheli & Rose) Macbride, Contr. Gray
Herb. 59: 18, 1919.

Terminal leaflets 11 mm wide (FLAS).

Mexico (FLAS), Guatemala, Salvador.

Piptadenia flava (Sprengel) Benth, Trans. Linn. Soc. 30: 371.
1875.

Leaflets 1-2 mm wide. Panama (FLAS).

Pithecellobium albicans (Kunth) Benth, Trans. Linn. Society
30: 592, 1875.

Leaflets 1-2 mm wide. Angelo. Similar to Albizia caribaea.
Yucatan, British Honduras.

Pithecellobium arboreum (L.) Urban, Symb. Antill. 2: 259, 1900.

Glands on petiole and axis of leaves. Leaflets (0.5-) 1-3 mm
wide. Angelo. Leaves much like those of Enterolobium cyclo-
carpum. Honduras, Jamaica, Puerto Rico (FLAS).

Nicaragua, Dept. Zelaya, Comarca del Cabo, Miguel Bikon.
Seymour 5915 (SEYM).

Pithecellobium austrinum Standley & Williams, Ceiba 3: 114.
1952. Costa Rica (FSU).

Leaflets 1-1.5 cm long, 3-4 mm wide. Similar to Pithecello-
bium arboreum. To distinguish them, characters follow:

A. Pinnæ 8-16 pairs; leaflets 20-40 pairs, 8-12 mm long, 1-3
mm wide; legume in age coiled or twisted, up to 18 cm long,
up to 1 cm thick Pithecellobium arboreum

A. Pinnæ 15-20 pairs; leaflets 15-20 pairs, 1-1.5 cm long, 3-4
mm wide, 3-nerved at base; legume narrowed between seeds,
15-17 cm long, 1.5-2 cm thick; stipe 2 cm long
. Pithecellobium austrinum

Pithecellobium Barbourianum Standley, Contr. Arn. Arb. 5: 74,
pl. 11, 1933. Known from type collection only: Panama,
Barro Colorado Island. Shattuck 237. Leaflets 3-6 mm
wide.

Pithecellobium belizense Standley, Field Mus. Bot. 4: 212,
1929. Type: British Honduras. M. E. Peck 673. Guatemala.

- Pithecellobium Bertolonii Bentham, Trans. Linn Soc. 30: 588, 1875. Known from type locality only, Guatemala, Escuintla, Coll. Velasquez.
- Pithecellobium Brenezii Standley, Field Mus. Bot. 18: 506, 1937. Costa Rica.
- Type: Costa Rica, Entire Rio Jesus y Alto de la Calera San Ramon. Brenes 17135 (F). Similar to Pithecellobium Englesingii Standley but has larger flowers, according to Fl. Costa Rica 18: 506, 1937.
- Pithecellobium Brownii Standley, Trop. Woods 18: 30, 1929. Type: British Honduras, Hillbank. C. S. Brown 28.
- Pithecellobium carbonarium (Britton) Niezgoda & Nevling, Phytologia 44: 310 & 380, 1979.
- Synonym: Albizzia carbonaria Britton, Sci. Surv. Porto Rico & Virgin Islands 6: 348, 1926. Type: C. L. Bates s.n.
- Pithecellobium catenatum Donnell Smith, Bot. Gaz. 48: 294, 1909. Terminal pair of leaflets 5-7.5 cm wide. Costa Rica, Panama.
- Pithecellobium costaricense (Britton & Rose) Standley, Tropical Woods 34: 40, 1933.
- Leaflets 5-10 mm wide. Costa Rica, Panama.
- Pithecellobium Donnell Smithii (Britton & Rose) Standley, Field Mus. Bot. 12: 168, 1936.
- Synonyms: Pithecellobium Gentlei Lundell, Contr. Univ. Mich. Herb. 6: 28, 1941. Pithecellobium plumosum Lundell, l.c. Pithecellobium Schippii Lundell, l. c.
- Leaflets 3-12 mm wide. No gland on petiole. Angelo. Largest leaflets mostly 7-11 mm wide, at tip of pinna. Angelo.
- Pithecellobium dulce (Roxb.) Bentham, Lond. Journ. Bot. 3: 199, 1844. Spines straight, slender, not always present. Spines on internodes scarce if any. Gland at summit of petiole often seeming absent. Petiole 1.5-4.5 cm long. Leaflets 1-3 cm wide. Legumes 4-10 cm long, much twisted and curled. Angelo.
- Florida (FLAS), Mexico (FSU).
- Nicaragua, Dept. Chinandega, Volcan Cosiguina. Neill 7104 (ENAG, FLAS, GH, MO, SEYM).
- Dept. Leon, Telica. Dudey, Hamblett & Nichols 213 (SEYM).
- Dept. Managua, Apoyeque. Marshall & Neill 6697 (ENAG, F., GH, NY, MO, SEYM).
- Esquipulas. Hall & Bockus 7982 (B, BM, GH, MO, NY, OSH, REED, SEYM, SMU, UC, UCA).
- Masachapa. Nichols 236 (SEYM).

Pithecellobium Englesingii (Standley) Standley, Tropical Woods 34: 40, 1933. Synonym: Inga Englesingii Standley, Tropical Woods 17: 27, 1929.

Nicaragua, northeastern. Coll. F. C. Englesing 205 (YU no. 13297).

Rachis and petiole are covered by numerous warts that I take to be glands. Angelo.

Pithecellobium erythrocarpum Standley, Field Mus. Bot. 12: 168, 1936. Type coll. near Botanic Station, lower Belize River, British Honduras. S. J. Record.

Leaflets 8-30 mm wide, mostly 10-20 mm wide. Angelo.

Pithecellobium Gentlei Lundell, Contr. Univ. Mich, Herb. 6: 28, 1941.

This species "has been confused with P. Donnell-Smithii (B. & R.) Standl." which has floral bractlets linear-lanceolate, at least twice as wide as the filiform-linear bractlets of P. Gentlei. In art., bractlets of P. Donnell-Smithii do not exceed 5 mm. Those of P. Gentlei become as much as 1 cm long." Treated as a synonym of P. Donnell-Smithii (B. & R.) Standley by Fl. Guatemala, p. 72.

Pithecellobium graciliflorum Blake, Contr. Gray Herb. 52: 69, 1917.

Leaflets 4-10 mm wide. Type. Angelo.

Pithecellobium halogenes Standley, Carnegie Inst. Wash. Publ. 461: 59, 1935.

Guatemala.

Pithecellobium hondurense B. & R., N. Amer. Fl. 23: 18, 1928. Young twigs pubescent. Stipular spines very short or none. Petiole stout, glabrous, about 2 cm long or shorter, the apical gland oval, cupulate; pinnae 1 pair; leaflets 1 pair, oblong-lanceolate, 8-11 cm long, 4-5 cm wide, acuminate, lustrous above, reticulate-veined, glabrous, l. c.

Pithecellobium hymenaeifolium (Humboldt & Bonpland) Bentham, Hooker Lond. Journ. Bot. 3: 198, 1844.

Leaflets 2-5 cm wide. Panama.

Pithecellobium insigne Micheli in Donnell Smith, Bot. Gaz. 20: 285. 1895.

S. Mexico, British Honduras, Honduras, Fl. Guatemala 5: 75, 1946.

Pithecellobium jinotegense Standley & Williams, Ceiba 3: 115, 1952.

Type: Nicaragua, Dept. Jinotega, E. of Jinotega, Finca Aventina. Standley 10015 (F); duplicate (EAP).

Nicaragua, Dept. Jinotega, Sierra Sialci, S. of Jinotega.

Standley 10441, 10466, 10504; all cited in Ceiba 3: 115, 1952.

Pithecellobium Johansenii Standley, Tropical Woods 16: 47, Dec. 1, 1928. Guatemala.

Pithecellobium keyense Britton ex Coker in Shattuck, Bahama Islands 255, 1905.

This species may be a synonym of Pithecellobium guadalupense Chapman. If not, they are to be distinguished as follows:

- A. Legumes not narrowed deeply between seeds; petioles 1-1.5 mm wide; leaflets leathery Pithecellobium guadalupense Chapman
- A. Legumes more deeply narrowed between seeds; petioles 0.5 mm thick; leaflets papery (chartaceous) Pithecellobium keyense Britton
- Nicaragua, Dept. Matagalpa, Calabazas. Atwood 2567 (ENAG, SEYM).

Dept. Boaco, Teustepe. Atwood 2419 (MO, SEYM, SMU).

Dept. Managua, Esquipulas. Hall & Bockus 7982 (B, BM, FLAS, GH, MO, NY, OSH, REED, SEYM, SMU, TEX, UC, UCA).

Pithecellobium lanceolatum (Humboldt & Bonpland) Bentham, Lond. Journ. Bot. 5: 105, 1846.

Synonyms: *Mimosa ligustrina* Jacq., Fragm. Bot. 29, pl. 32, f. 5, 1801.

Inga lanceolata Humboldt & Bonpland ex Willd. Sp. Pl. 4: 1005. 1806.

According to Fl. Guatemala p. 79, this species "can be separated with certainty from P. pachypus only when legumes are present." Leaflets 14-23 mm wide.

British Honduras, Guatemala, Honduras, Costa Rica, Panama. Nicaragua, Dept. Zelaya, Madregara. Atwood 3050 (SEYM).

Dept. Chontales, between Juigalpa and Santo Tomas. Neill 7300 (BM, FLAS, GH, MO, NY, SEYM, SMU, UCA).

Dept. Granada, Vera Cruz. Hall & Bockus 7828 (REED, SEYM).

Pithecellobium latifolium (L.) Bentham in Hooker Lond. Journ. Bot. 3: 214, 1844.

Terminal leaflets 1.5-6 cm wide, lowest ones much smaller. Honduras (FSU).

Nicaragua, Dept. Zelaya, Limbaikan. Atwood 4879 (BM, ENAG, GH, MO, SEYM, SMU).

Pithecellobium leucocalyx (Britton & Rose) Standley, Field Mus. Bot. 4: 308, 1929.

Leaflets 1-3 cm wide. Angelo. Guatemala.

Pithecellobium leucospermum Brandegee, Univ. Calif. Publ.

Bot. 10: 182, 1922. See Prosopis juliflora for comparison.

Guatemala. We have seen no specimen of this species.

Pithecellobium longifolium (Humboldt & Bonpland) Standley,

Field Mus. Bot. 4: 212, 1929.

Terminal pair of leaflets 1.5-3.5 cm wide; lower ones smaller.

Costa Rica (FLAS, FSU).

According to Fl. Guatemala p. 81, this species is not clearly distinguishable from Pithecellobium Recordii.

Nicaragua, Dept. Chontales, Santo Tomas. Neill 7397 (B, GH, MO, SEYM, SMU, UCA).

Pithecellobium macradenium Pittier, in Contr. U. S. Nat.

Herb. 20: 465, 1922. Known from type only.

Leaflets 1-2.2 mm wide.

Pithecellobium macrandrium Donnell Smith, Bot. Gaz, 40: 3, 1905.

Leaflets 2-4 (7) mm wide. Angelo. Guatemala.

Pithecellobium mangense (Jacq.) Macbride, Contr. Gray Herb.

59: 3, 1919.

Spines may be absent on young branches. Leaflets about 1 mm wide. Panama (FLAS).

Pithecellobium nicoyanum (Britton & Rose) Niezgodka & Nevling, Phytologia 44: 379, 1979.

Synonym: Albizzia nicoyana Britton & Rose, N. Amer. Fl. 23: 47, 1928. Costa Rica, Nicoya. Tonduz 13885.

Pinnæ 5-6 pairs. Leaflets 1-2.5 cm long, acute.

Pithecellobium oblongum Benthām in hooker Lond. Journ. Bot. 3: 198, 1844.

Synonym: Pithecellobium microstachyum Standley, Journ. Wash. Acad. Sci. 13: 439, 1923.

Legumes about 7 cm long, much curled. Angelo. Leaflets 3.5 cm wide. Panama.

Pithecellobium pachypus Pittier, Contr. U. S. Nat. Herb. 20: 457, 1922.

Mexico, Guatemala, Salvador.

Pithecellobium palmanum Standley, Field Mus. Bot. 18: 508, 1937. Costa Rica.

Pithecellobium Peckii Blake, Contr. Gray Herb. 52: 71, 1917.

Known from the type only: British Honduras. Peck 738 (GH).

Type specimen examined. Petiole without a gland. Leaflets 1-6 cm wide, typically 3-4 cm wide. Angelo.

Pithecellobium pistaciifolium Standley, Carnegie Inst. Wash.

Publ. 461: 59, 1935. Known from type only: British Honduras, Rio Grande. W. A. Schipp 1260.

Leaflets 5-8 mm wide.

Pithecellobium platylobum (Sprengel) Urban, Sumb. Antill. 5: 360, 1908.

Leaflets 7-15 mm wide. Rachis glabrous or nearly so except at base of pinnae. Legume straight. Angelo.

Pithecellobium plumosum Lundell, Contr. Univ. Mich. Bot. 6: 30, 1941.

Sometimes treated as a synonym of Pithecellobium Donnell-Smithii (Britton & Rose) Standley, q. v. Similar to Pithecellobium Gentlei Lundell. Pithecellobium sophorocarpum may be closely allied.

The conspicuous reticulation of leaflets on lower surface. Only 2 pairs of pinnae. Leaflets larger. These characters distinguish it from P. Gentlei and P. Donnell-Smithii. Guatemala.

Pithecellobium pseudo-Tamarindus (Britton) Standley, Field Mus. Bot. 4: 212, 1929.

Leaflets almost 2 mm wide.

Pithecellobium racemiflorum Donnell Smith, Bot. Gaz. 56: 57. 1913.

Known from type locality only. Costa Rica, Las Vueltas, Tucurrique.

Pithecellobium Recordii (Britton & Rose) Standley, Field Mus. Bot. 4: 212, 1929.

Type: Andes Region. S. J. Record 5.

According to Fl. Guatemala p. 81, Pithecellobium Recordii is not certainly distinct from Pithecellobium longifolium.

British Honduras, Guatemala.

Pithecellobium Saman (Jacq.) Benthams, Lond. Journ. Bot. 3: 216, 1844.

Leaflets 2 cm wide.

Guatemala, Panama, Jamaica, Tinian, Mariana Islands (FLAS), Costa Rica (FSU).

Nicaragua, Dept. Matagalpa, Laguna Moyua. Neill 7217 (SEYM, UCA).

Dept. Granada, Isletas de Granada. Seymour & Neill 6603 (ENAG, MO, SEYM).

Pithecellobium saxosum Standley & Steyermark, Field Mus. Bot. 23: 163, 1944. Guatemala.

Nicaragua, Dept. Matagalpa, Sebaco. Seymour 2537 (B, BM, F, FLAS, GH, MICH, MO, NY, SEYM, SMU, UC, WDP).

Pithecellobium Schippii Lundell, Contr. Univ. Mich. Herb. 6: 31, 1941.

Allied to Pithecellobium Donnell-Smithii and P. tenellum.

Differs from P. Donnell-Smithii in having leaflets puberulent over both surfaces. Differs from P. tenellum in having small-

er leaflets and slender bractlets. British Honduras.

Pithecellobium sophorocarpum Benthām in Benthām & Hoover
Gen. 1: 598, 1865. For description, see N. Amer. Fl. 23:
31, 1928

Leaflets 5-10 mm wide. Midrib hairy beneath, less so above,
otherwise essentially glabrous. Angelo.

Pithecellobium Stevensonii (Standley) Standley & Steyermark
Field Mus. Bot. 23: 164, 1944.

Type from British Honduras, Freshwater Creek, Stevenson
65. Guatemala.

Pithecellobium tenellum (Britton & Rose) Standley, Field Mus.
Bot. 12: 216, 1931.

Leaflets 7-20 mm wide. Angelo. British Honduras.

Pithecellobium Tonduzii (Britton & Rose) Standley, Field Mus.
Bot. 4: 308, 1929.

Leaflets 1.5-2 cm long, oblong or lance-oblong.

Guatemala, Volcan de Pacaya. Tonduz 450, Type.

Pithecellobium Tuerckheimii (Britton & Rose) Standley & Steyer-
mark, Field Mus. Bot. 23: 164, 1944.

Leaflets about 1 mm wide. Petiole and rachis with numerous
stipitate glands. Angelo.

Type: Guatemala, Coban. Tuerckheim II. 1769.

Pithecellobium Valerioi (Britton & Rose) Standley, Field Mus.
Bot. 18: 509, 1937.

Synonym: Pithecellobium Standleyi (Britton & Rose) Standley
Field Mus. Bot. 18: 509, 1937.

Terminal pair of leaflets sometimes 6 cm wide.

Costa Rica, Panama.

Pithecellobium vulcanorum Standley & Steyermark, Field Mus.
Bot. 23: 164, 1944.

Leaflets 3-5 mm wide. Angelo. Flowers unknown.

Guatemala, Honduras, Salvador.

Pithecellobium Zollerianum Standley & Steyermark, Field Mus.
Bot. 22: 343, 1940.

Type: Guatemala, Volcan de Tajumulco, above Finca Porwenir,
Steyermark 37440.

Prosopis juliflora (Sw.) DC., Prodr. 2: 447, 1825.

Synonym: Prosopis chilensis (Molina) Stuntz, U. S. Bureau In-
dustry 31: 85, 1914.

Leaflets 1-5 mm wide. Legumes septate, not opening.

Flowers in spikes. Similar to Pithecellobium leucospermum
which has flowers in dense heads.

Mexico, Jamaica, Puerto Rico.

Nicaragua, Dept. Leon, Puerto Somoza. Neill 6636 (BM,
ENAG, GH, MO, NY, SEYM, SMU, UC).

Nicaragua, Dept. Managua, Tipitapa. Seymour 3448 (BM,
ENAG, F, GH, MO, NY, SEYM, SMU, UC).
Schizolobium parahybum (Vell.) Blake, Contr. U. S. Nat. Herb.
20: 240, 1919.

Leaflets 4-7 mm wide.

Costa Rica, Panama, Brazil (FLAS).

Nicaragua, Dept. Granada, Volcan Mombacho. Atwood & Neill
1562 (FSU).

Schrankia hamata Humboldt & Bonpland ex Willd., Sp. Pl. 4:
1042, 1806. Panama.

Schrankia leptocarpa DC., Prodr. 2: 443. 1825.

Leaflets 1-2 mm wide. Guatemala, Costa Rica, Panama.

Nicaragua, Dept. Zelaya, Puerto Cabezas. Nelson 4470 (GH,
MO, SEYM, SMU).

Tamla. Robbins 5934 (SEYM).

Stryphnodendron excelsum Harms, Repert. Sp. Nov. 19: 64,
1923.

Leaflets 8-10 mm long. Angelo.

Costa Rica; not known in Panama but to be expected there.

Excluded species

Pithecellobium fragrans Benthham in Hooker Lond, Journ. Bot.
3: 220, 1844.

British West Indies, Fawcett & Rendle Fl. Jamaica.

Doubtfully in Central America. Fl. Panama, Ann. Mo, Bot.
Gard. 37: 247, 1950.

Occurrence in Central America not confirmed.

ABBREVIATIONS in addition to those in common use.

B. & R., Britton, N. L. & J. N. Rose

Bth., Benthham

C. & S., Chamisso & Schlechtendal

ENAG, Herbarium of Escuela Nacional de Agricultura y Gana-
deria, Managua, Nicaragua

H. & B., Humboldt & Bonpland

Illustr., Illustration or Illustrated

S. A., South America

SEYM, Herbarium of Frank C. Seymour

Stan., Paul C. Standley

St. & St., Standley, Paul C. & Julian A. Steyermark

UCA, Herbarium of Universidad Centro-Americana, Managua,
Nicaragua

WDP, Herbarium of St. Norbert College, West De Pere, Wis.

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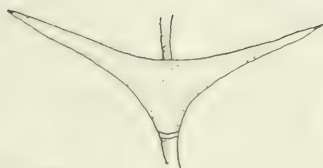
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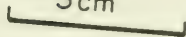
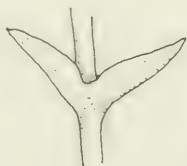
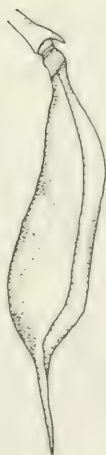
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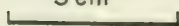
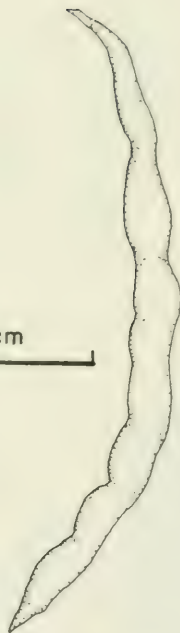
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*ACACIA Hindsii*

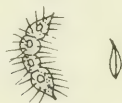
3 cm

*ACACIA Farnesiana**ACACIA cornigera*

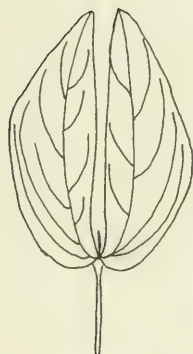
3 cm

*ACACIA tortuosa*

MIMOSA pudica

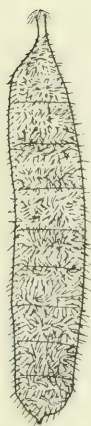


MIMOSA hemiendytia

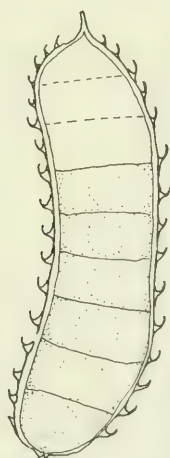


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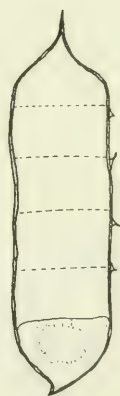
MIMOSA albida



MIMOSA pigra



MIMOSA hondurana

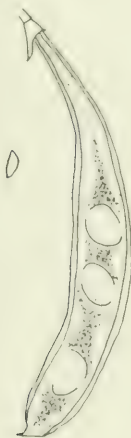


MIMOSA hondurana

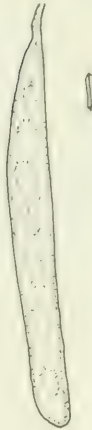


3 cm

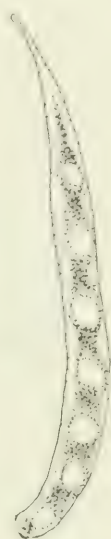
CALLIANDRA
grandiflora



CALLIANDRA
portoricensis

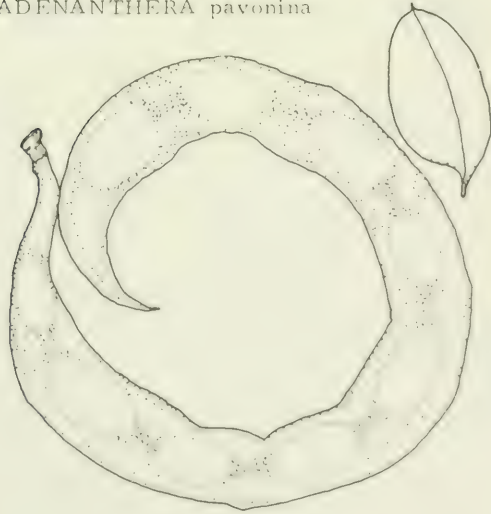


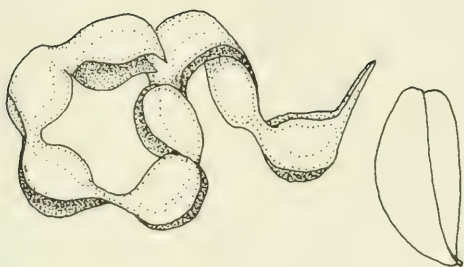
CALLIANDRA
capillata



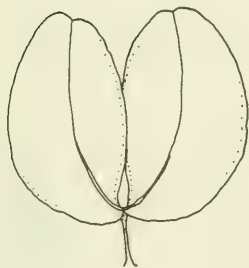
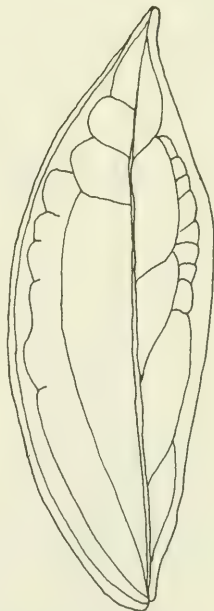
3 cm

ADENANTHERA pavonina





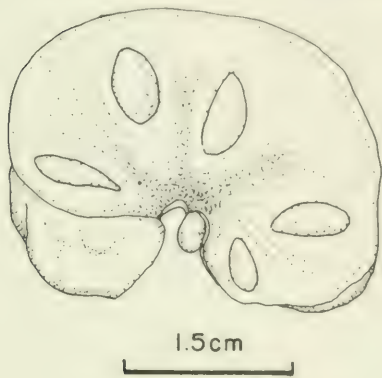
PITHECELLOBIUM dulce

PITHECELLOBIUM
dulceCALLIANDRA
rhodocephala

3 cm



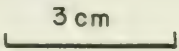
ENTEROLOBIUM cyclocarpum



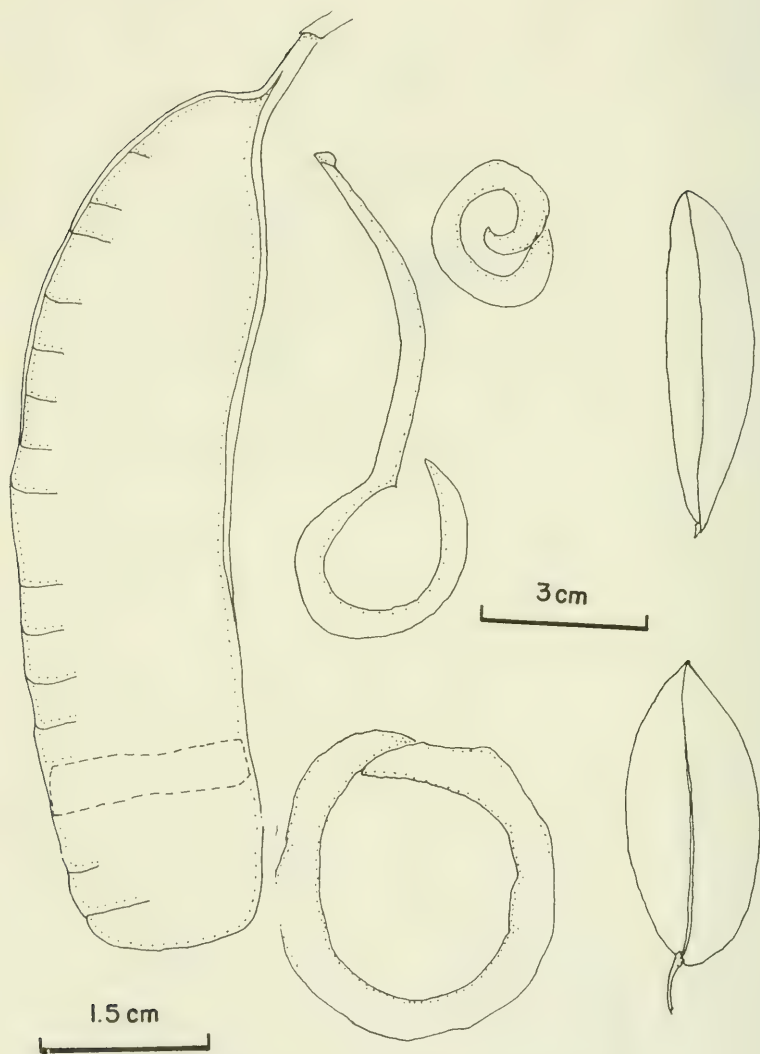
o



PITHECELLOBIUM austrinum



DESMANTHUS virgatus



PITHECELLOBIUM
lanceolatum

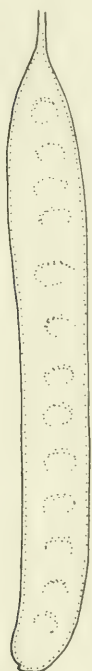
ENTADA polystachya

PITHECELLOBIUM latifolium

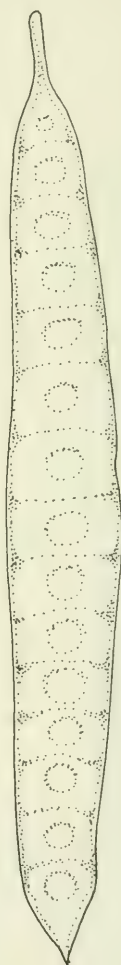
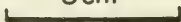


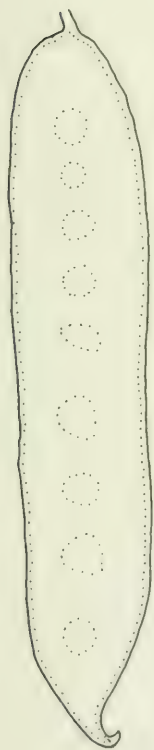
PITHECELLOBIUM longifolium



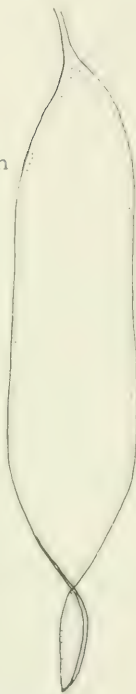
*LEUCAENA Shannonii**LEUCAENA latisiliqua*

3cm

*PITHECELLOBIUM Saman*

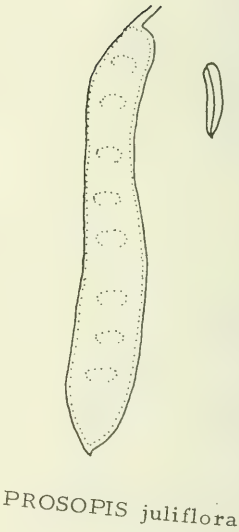
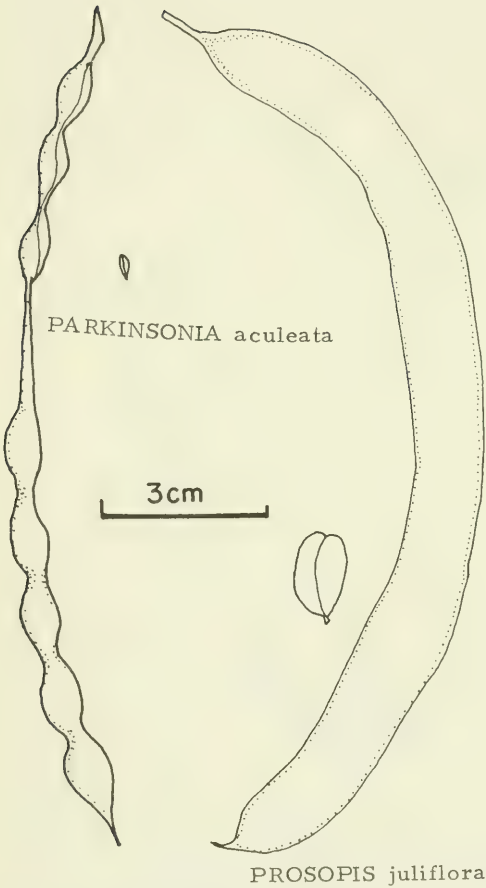
*LYSILOMA acapulcense**ALBIZZIA* Lebeck

1.5cm

LYSILOMA
multifoliolatum

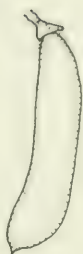
3cm

LYSILOMA
bahamense

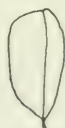


PARKINSONIA aculeata

CAESALPINIA
vesicaria



3 cm



CAESALPINIA
pulcherrima



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CONTRIBUTION TO THE LICHEN FLORA OF BRAZIL VIII.

Lichens from Morro do Coco, Viamao, Rio Grande do Sul.

Héctor S. Osorio.

Departamento de Botánica, Museo Nacional de
Historia Natural, Montevideo URUGUAY.

In November 1980 the author was cordially invited by Prof. Albano Bakes of the Fundacao Zoobotanica do Rio Grande do Sul to make a short field trip to a hill called Morro do Coco in the Municipality of Viamao, 50 km S from Porto Alegre, Rio Grande do Sul State. Such a hill is located on the banks of Guaiba River and is covered with a luxuriant tree vegetation with many specimens of a palm-tree (Arecastrum romanzoffianum) after which this elevation is named. Recently a floristic research was carried on in this locality (Knob 1978). The illustrations of the resultant work give a clear account of its floristic richness.

The zone visitated by the author was the foot of the hill just sloping down on the bank of the Guaiba River. There, lichens were collected from several species of trees and boulders situated on this slope. Although the number of samples is rather small, mainly to the lack of disponsable time, the author considered a matter of interest to make known the results as a contribution to the knowledge of the lichen flora of the Great Porto Alegre.

The specimens here reported are preserved in the author's private herbarium and the numbers belong to the author's numbering system.

Anthracothecium goniostomum Müll.Arg.

On Sebastiania klotschiana, 7808.

Dulbothrix goebelii (Zenk.) Hale

On Inga uruguayensis, 7818. First report for Rio Grande do Sul State. Previously it has been reported from the States of Goias, Mato Grosso and Sao Paulo (Hale 1976).

Candelaria concolor (Dicks.) Arn.

On trunk of shrubs, bank of Guaiba River, scarce,
7822

Cladonia miniata Mey. var. sorediella Vain.

On rotten Eucalyptus trunk, 7794. In Brazil this taxon is reported from Mina Geraes (Vainio 1887, Zahlbruckner 1904), Bahia (Vainio 1887) and Sao Paulo (Zahlbruckner 1909). The present record enlarges southwards the known distribution in Brazil. The southernmost known record of this species in South America is in Uruguay: Rocha, Castillos (Osorio 1975).

Caloplaca crocea (Kremp.) Haf. & Poelt.

On Ficus organensis, 7805; on Ficus organensis, bank of Guaiba River, 7806 pro parte.

Caloplaca puiggarii (Müll. Arg.) Zahlbr.

On stones, inside the forest, 7827. In Rio Grande do Sul State this species is only known through a single collection from Porto Alegre (Malme 1926).

Caloplaca xanthobola (Kremp.) Zahlbr.

On stones inside the forest, 7829.

Dimerella zonata (Müll. Arg.) R. Sant.

On leaves of Rubiaceae, inside the forest, 7812. In Brazil formerly known only from Sao Paulo State (Santesson 1952). The collection here reported is the southernmost record of this species for South America.

Dirinaria applanata (Fée) Awast.

On Inga uruguayensis, 7816; on Sebastiania klotschiana, 7811.

Dirinaria confluens (Fr.) Awast.

On perpendicular stones, bank of Guaiba River, 7825. Already reported from Porto Alegre, two corticolous collections (Lynge 1924, Awasthi 1975).

Dirinaria picta (Sw.) Clem. & Shear.

On Ficus organensis, 7804.

Glyphis cicatricosa (Ach.) Vain.

f. confluens (Zenk.) Zahlbr.

On Sebastiania klotschiana, 7810; on Inga uruguayensis 7817 pro parte.

Graphis lineola Ach.

On Chorisia speciosa (trunk's thorns), 7830 pro parte; on Inga uruguayensis, 7817 pro parte.

Graphis striatula (Ach.) Spreng.

On Sebastiania klotsciana, 7809; on Chorisia speciosa (trunk's thorns) 7830 pro parte. First report for Rio Grande do Sul State.

Heterodermia albicans (Pers.) Swinsc. & Krog.

On Inga uruguayensis, 7815.

Heterodermia diademata (Tayl.) Awast.

On Inga uruguayensis, 7820

Heterodermia obscurata (Nyl.) Trevis.

On Inga uruguayensis, 7821; on trunk of shrubs, 7832
Iecidea russula Ach.

On trunk of Arecastrum romanzoffianum inside the forest, 7823.

Leptogium austroamericanum (Malme) Dodge.

On trunk of Ficus organensis, 7803. Although this species is largely distributed in tropical and subtropical America (Sierk 1964) in Rio Grande do Sul State is only known from the type locality: Cachoeira, in the central region of the States (Malme 1925).

Parmotrema reticulatum (Tayl.) Choisy.

On perpendicular stones, bank of Guaiba River, 7796.

Parmotrema tinctorum (Nyl.) Hale.

On Inga uruguayensis, 7797, 7819; on Tabebuia pulcherrima, 7801.

Physciopsis syncolla (Tuck.) Foelt.

On Ficus organensis, bank of Guaiba River, 7806 pro parte.

Physcia alba (Fée) Müll. Arg. var. obsessa (Mont.) Lynge

On Inga uruguayensis, 7814.

Physcia crispa Nyl.

On trunk of shrubs, 7831.

Ramalina complanata (Sw.) Ach.

On Inga uruguayensis, 7798.

Ramalina usnea (L.) R. Howe.

On Tabebuia pulcherrima, 7800 (Chemical race II); on Ficus organensis, 7802 (Chemical race III). The number of specimens of the three chemical races reported for the South of South America (Hundel 1978) is very reduced. This fact unable us, at present, to recognize different distributional patterns in this part of South America.

Strigula elegans (Fée) Müll. Arg.

On Allophylus edulis, 7813.

Teloschistes flavicans (Sw.) Norm.

On Tabebuia pulcherrima, 7799.

Trypethelium ochroleucum (Lschw.) Nyl.

On trunk of Arecastrum romanzoffianum, inside the forest, 7824.

Usnea densirostra Tayl.

On boulders, bank of Guaiba River, locally common, 7795. This species is one of the few of this genus that we found quoted for the Municipality of Viamao (Motyka 1936-38).

ACKNOWLEDGMENT.

The author wants to express his gratitude to Prof. Albano Baker for his aid and many facilities given in the performance of the field work as well as for the identification of the phanerogams here reported.

SUMMARY.

Thirty-one lichen species collected in a hill named Morro do Coco, Municipality of Viamao, Rio Grande do Sul State are listed.

The following species are reported for the first time for Rio Grande do Sul State: Bulbothrix goebelii, Cladonia miniata var. sorediella, Dimerella zonata and Graphis striatula.

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Taxonomía y distribución
de las gramíneas de México, I.
Hydrochloa caroliniana var. oconnori: (Guzmán) n. sp.
Una nueva variedad de importancia forrajera.

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El género Hydrochloa es monotípico (Gould, 1968: 307) y con una dispersión conocida para Hitchcock (1951: 566), de North Carolina a Florida y Louisiana. Más recientemente ha sido reportada por Calderón de Rzedowski para el Valle de México (1974: 25), y para el estado de Jalisco por Carvajal (1980: 146), véase el mapa No. 1. Las plantas de Jalisco, provenientes del oeste del estado, presentan un notable incremento en las dimensiones de las partes sexuales y vegetativas. Al comparar nuestros especímenes con material auténtico, sospechamos que podría tratarse de una nueva variedad. Por sugerencia del Dr. Thomas R. Soderstrom, del Smithsonian Institute, enviamos un ejemplar al Dr. Peter O'connor, especialista en Oryzoideae del New York Botanical Garden, quien tuvo la amabilidad de examinar el material y coincidió con nuestra opinión. La variedad se describe ahora por primera vez y se ha nombrado en honor del Dr. O'connor, en atención de sus contribuciones a este grupo.

Hydrochloa caroliniana var. oconnori Guzmán var. nov.

Planta perenne de 1 m ó más de largo, de tallos glabros ramificados hacia los nudos, con varias raíces

Mapa 1. Distribución conocida de las poblaciones nativas del género Hydrochloa en México.



capilares en los nudos a lo largo del tallo; hojas planas, glabras en la superficie inferior y escabrosas en el primer tercio de la superficie inferior, de (5-) 6.2-8.3 cm de largo por (4-) 5-6 (-8) mm de ancho; vainas ligeramente más cortas que los entrenudos, glabras, con excepción de los márgenes de la garganta donde tiene numerosos pelos blancos y sedosos, las vainas envuelven por completo el tallo únicamente en el primer tercio inferior del entrenudo; lígula, una membrana delgada de borde entero, de unos 3 mm de largo; espiguillas unisexuales, uniflosculadas, subsésiles, desprendiéndose en la base del pedicelo; espiguillas estaminadas solitarias, en racimos terminales de pocas flores, sin glumas, de 6-7.5 mm de largo, lema y palea hialinas, la lema 7 - nervada, la palea 2 - nervada; estambres 6, las anteras de (3.5-) 4.5-4.8 mm de largo sobre largos filamentos de cerca del tamaño de la antera; espiguillas pistiladas en las axilas de las hojas, de 3.5-4 mm de largo, con 2, rara vez 4 ó 5, largos estilos, delgados y plumosos; cariopsis desconocido.

Gramen perenne, 1 m longum vel majus; culmi glabri, ad nodos ramosi, radicibus adventitiis pluribus in nodis secus culmum; laminae planae, supra glabrae, infra tertio primo scabrae, (5-) 6.2-8.3 cm longae, (4-) 5-6 (-8) mm latae; vaginae internodiis aliquantum breviores, glabrae, tantum tertio primo infero culmum amplectentes; ligula sub formis membranae tenui margine integro, 3 mm longae; spiculae unisexuales, uniflorae, subsessiles, pedicelli basi deciduae; spiculae staminatae solitariae, in racemis terminalibus paucifloris dispositae, sine glumis, 6-7.5 mm longae, lemma paleaque hyalina, lemma 7-nervata, palea 2-nervata; stamina 6, antherae (3.5) 4.5-4.8 mm longae; spiculae pistilatae 3.5-4.3 mm longae, stylibus longis, 2, raro 4-5, tenuibus, plumosis; caryopside ignotum.

Tipo en el Herbario de la COTECOCA¹, colectado en

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1. Comisión Técnico Consultiva para la Determinación Regional de los Coeficientes de Agostadero, fundada en 1966, y es dependencia de la Secretaría de Agricultura y Recursos Hidráulicos. Las siglas aún no se han registrado en la Asociación Internacional de Taxonomía.

charcos permanentes poco profundos y en arroyos de curso lento con Sacciolepis myuros, Leersia hexandra, Jussiaea repens var. peplodes, Lobelia fenestralis, Aeschynomene sp. y Heteranthera sp., en el Valle del Jacal, al W de San José de los Andrade, sobre la brecha Ayutla - Mascota, JALISCO (R. Guzmán & de la Rosa 66). Holotipo en NY. Isotipos en US, IBUG y MICH. Paratipo de la misma localidad (Guzmán & Guzmán 966) en ENCB.

El área en donde crece H. caroliniensis var. oconneri, está a 1500 m de altitud, es campo abierto con pastizal mixto de Muhlenbergia sp., Bothriochloa saccharoides, Digitaria leucites, Aristida scribneriana, Sorghastrum sp. y Arundinella palmeri. Frecuentemente aparecen especies asociadas de Tagetes lucida, Cleome speciosa, Bessera elegans y Cuphea sp., entre otras. Los zacatonales de Muhlenbergia macroura se presentan en forma más bien espaciada. Es probable que originalmente todo el Valle haya estado cubierto con vegetación de pinar o pinar o encinar. Actualmente existen especies esporádicas de Pinnus oocarpa y P. michoacana. Entre los encinos observados se colectaron Quercus resinosa, Q. magnoliifolia, Q. praineana, Q. coccolobifolia y Q. aristata. De acuerdo a la clasificación climática de Koeppen (modificada por García, 1973), el clima es templado sub-húmedo con lluvias en verano. El período de lluvias es de junio a octubre, con presencia de heladas.

La variedad oconneri se distingue fácilmente de la especie típica en las dimensiones de sus hojas, espiguilla, y otras. Los caracteres específicos contrastantes se resumen en la tabla No. 1.

Las especies de Hydrochloa están tal vez más ampliamente distribuidas que lo que actualmente se conoce. El tamaño inconspicuo de las flores, aunado a un período corto e irregular de floración, son quizá los factores por los cuales ha pasado largamente desapercibida. J. Rzedowski (comunicación personal), sugiere que las plantas de H. caroliniensis permanecen largos períodos con reproducción vegetativa, y que la época de floración tal vez ocurra en el punto crítico cuando el nivel del agua no se incrementa, y, por el contrario, tiende a descender. Esto seguramente es valido para ciertas poblaciones, principalmente aquellas expuestas a un pastoreo intensivo. En otras, no se ha encontrado una correlación entre la época de floración con el nivel del agua. Algunas poblaciones

Tabla 1

CARACTERES ESPECÍFICOS DE *HYDROCHLOA*. LOS NÚMEROS DE LOS PARENTESIS INDICAN LAS VARIACIONES DE LAS CONDICIONES NORMALES.

ESPECIE	HOJA (mm.)		FORMA DE LA HOJA	TAMANO DE LA LIGULA EN mm.	TAMANO DE LA ESPIGUILLA ♂ EN mm.	TAMANO DE LA ANTERA EN mm.	TAMANO DE LA ESPIGUILLA ♀ EN mm.
	ANCHO	LARGO					
<i>H. carolinensis</i> .	1-3 (-4)	50-80	LINEAR	0.5-2	4	3-4	2
<i>H. carolinensis</i> var. <i>oconneri</i> .	5-6 (4-8)	62-83	LANCEOLADO	3	6-7 5	(-3.5) 4.5-4.8	3.5-4

tienen una acusada tendencia a florecer bajo el golpeteo continuo de la lluvia, mientras que otras prefieren la desaparición casi total del espejo acuífero.

H. caroliniensis var. oconneri llega a formar carpetas de cobertura uniforme en donde se establece. Según información recabada y observaciones personales, la especie es preferida por el ganado que tiene acceso a los lugares donde crece. El análisis bromatológico (véase la tabla No. 2), arroja como resultado, un alto valor alimenticio. Por todo lo anterior, creemos conveniente hacer otros estudios tendentes a explorar la posibilidad de introducirla en áreas ganaderas con ecología similar.

Tabla 2

ANÁLISIS QUÍMICO BROMATOLÓGICO DE

Hydrochloa caroliniensis var. oconneri.

Constituyente	Base húmeda %	Base Seca %
Humedad (100 - 110 °C)	59.80	----
Proteína cruda (NX 6.25)	4.00	9.90
Grasa cruda	0.10	0.80
Fibra cruda	6.40	15.90
Materia mineral (550-600 °C)	12.20	30.40
Ext. libre de Nitrógeno (por diferencia)	17.50	43.00
Fibra detergente neutro	25.05	62.32
Contenido celular	74.95	37.68
Fibra detergente ácido	13.59	33.81
Lignina	2.89	7.20
Celulosa	5.73	14.27
Calcio	0.55	1.50
Fósforo	0.21	0.57

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El Dr. J. Rzedowski, del Instituto Politécnico Nacional, revisó y corrigió la versión latina. Asimismo, me comentó sus experiencias personales con Hydrochloa. El Ing. Sergio H. Contreras, Jefe del Departamento Técnico de COTECOCA, revisó críticamente lo relativo al aspecto forrajero y tramitó los gastos de publicación. El autor sinceramente agradece esas valiosas comunicaciones y ayuda.

BIOGEOGRAPHY AND ORIGIN OF *SOLANUM ACAULE* BITTER

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The wild Andean potato species, *S. acaule* Bitter, has long been of interest to both the systematist and the horticulturalist because of its tetraploid chromosome number ($2n=48$; an amphidiploid fide Rybin 1929, 1933), and the fact that it grows at high elevations under climatic conditions which are unsuited for the cultivation of the common potato, *S. tuberosum* L. As this species is remarkably resistant to frost, it has been utilized by plant breeders in the development of several new varieties of the cultivated potato which are adapted for growth in northern regions.

However, the botanical origin of *S. acaule*, as well as its reproductive behavior and biogeography, remain as several aspects of its natural history which have not as yet been sufficiently explored, and which are in need of further study if the full potential of this species for varietal improvement purposes is to be realized. It is towards the partial fulfillment of these ends, therefore, that the following remarks have been directed.

ECO-GEOGRAPHIC CONSIDERATIONS.--*S. acaule* is a low, rosette-forming plant of the Peruvian-Bolivian altiplano and high mountain regions of northern Argentina. It is usually found between 3500 and 4500 meters, although individuals growing just below snow line at elevations of 5000 meters have been reported (Bukasov 1939). It occurs at elevations higher than that known for any other potato species. Its north-south extension is about 2700 km., occurring from the Department of Cajamarca, Peru, to the Andes of La Rioja, Argentina (Fig. 1).

As in the case of the many wild diploid species of *Solanum*, Section *Tuberarium* (cf. Correll 1962), which grow primarily in weedy or disturbed habitats throughout the Andes, the tetraploid *S. acaule* also grows along open roadsides, trails, and cultivated fields, as well as in and along the rock rubble of ancient Inca ruins. The natural habitats of this plant, however, are in the seasonally dry and windswept grasslands (or punas) of southern Peru and northern Bolivia. These high tableland communities are essentially devoid of the thorny bushes, large cacti, cliffs, rocks, and other natural features which, in other places, often serve to shelter and protect the wild species of this group from grazing animals. However, *S. acaule* not only tolerates but seems to prosper under conditions of

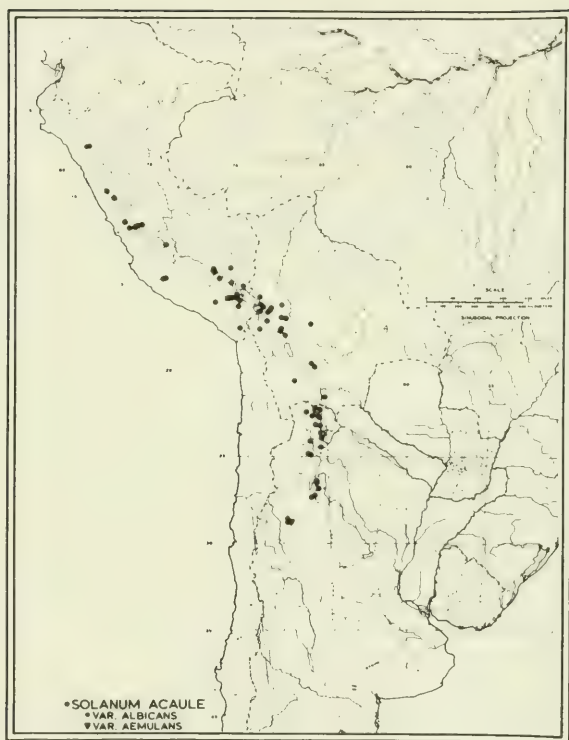


Fig. 1. Distribution of *Solanum acaule*.

heavy grazing. This behavior, an oddity in Section *Tuberarium*, is also shared by *S. megistacrolobum*, a rosette-forming diploid species with which it sometimes grows.

Plants of *S. acaule* are frequently found growing between clumps of *Stipa ichu* Kunth, one of the wire-leaved species of bunch grasses which are so common in the Andes. The spaces between these tussocks are frequently heavily grazed by llamas and alpacas, or by sheep, horses or cattle. And yet, little harm appears to be done to these plants by animals. Since the leaves of *S. acaule* are spread flat upon the ground, forming a rosette, they are cropped only with difficulty by the grazing animals (compare, in this case, the common dandelion, *Taraxacum officinale* Weber, a rosette-forming species notorious for its resistance to mowing). Similarly, the flowers, while occasionally grazed, are largely protected by their proximity to ground level. The stems and fruiting pedicels of this species, however, commonly elongate greatly at maturity, thus elevating the berries to a height where they can be more readily cropped by grazing animals.

The ability of this species to grow and prosper under conditions of heavy grazing would appear to be related to both its growth form and to its manner of seed dispersal. Abundant individuals of this species, for example, are commonly to be found in the vicinity of shepherd's huts (*chozas*) in the high Andes, as well as in the compacted, rocky soils of nearby fields and yards where sheep, llamas, and alpacas are herded for the night. The soil in these areas is covered with a layer of animal droppings, these usually containing the undigested and still viable seeds of a number of different plant species, including *S. acaule*. Later, when the seeds germinate, the rotting manure provides abundant fertilizer for the developing plantlets.

It is apparently not unusual for the seeds of certain plant species to be distributed in this manner. Rick (1961), for example, reports that the seeds of certain Galapagos varieties of the common tomato (*Lycopersicon esculentum* var. *minor*) are regularly dispersed from island to island as a result of the migratory wanderings of the giant tortoise, *Testudo elephantopus porteri*. The results of germination tests conducted on the seed recovered from the feces of these animals suggest that the mild digestive treatment they receive is an important factor in the breakage of the seed dormancy of these varieties. Without such treatment, less than 1% of the seeds of the tomato will germinate naturally, as opposed to 85% of seeds obtained from fecal matter.

Similar germination test-results have been reported by Harman and Keim (1934) for the seed of six different

species of weeds recovered from the manure of calves, horses, sheep, hogs and chickens; by Burton and Andrews (1948) for the seed of Bermuda grass fed to cattle; by Roessler (1936) for the seed of certain weed species digested by California linnets or finches; by H.G. Baker (in Rick 1961) for the seed of the African baobab and sausage trees collected from the dung of baboons; and by Rick (1961) for the seed of edible species of *Carica* and *Passiflora* eaten by human field workers in Ecuador!

Another line of evidence relating to the dispersal of the seed of *S. acaule* by means of grazing animals concerns the fruiting pedicels of this species. These, unlike those of any other species of this section, are non-articulated. Thus, the fruits normally remain firmly attached to the stem until they are cropped by grazing animals, and are not easily dislodged by birds, wind, or rain. This then, along with the factors related above, would tend to explain the frequent occurrence of this plant along roadsides, pathways, adobe walls, fields and water courses, as well as in village courtyards, plazas, and other places where grazing animals are occasionally herded.

The llama, which is the common beast of burden in the highlands of Peru and Bolivia, is mostly driven at a leisurely pace, in a herd, grazing as he goes. The seed and fruits of the plants that are eaten at the start of a journey, or along the way, may thus be contained in droppings spread along a 15 to 25 kilometer path by nightfall. As pointed out previously, the germinability of seed distributed in this manner is much improved as the result of the scarification of the seed coat through the action of intestinal enzymes and stomach acid.

Grazing animals, as seed dispersal agents, may occasionally introduce two or more closely related species into an open habitat where, if conditions are favorable, they hybridize. The Argentine triploid, *S. brucheri* Correll ($2n=36$), appears to have been formed in this manner. According to Brücher (1959), it is a naturally occurring hybrid between *S. acaule* ($2n=48$) and *S. megistacrolobum* ($2n=24$). Correll (1962) remarks that this plant frequently grows in dung deposited in the places where grazing animals congregate for the night. He cites specimens collected from sheep corrals, and from roadsides, rockwalls and yards of livestock ranches. *Solanum acaule* and *S. megistacrolobum* are also found in these same habitats and have been cited as occurring in the same localities as *S. brucheri* by Correll and Brücher (1959). These observations suggest that grazing animals may play a much more important role in the evolution of diverse new forms of *Solanum* than has been previously thought.

BREEDING BEHAVIOR.--In contrast to the wild diploid potato species of Peru, Bolivia, and Argentina, all of which are self-sterile and are thus obligate outcrossers, the tetraploid *S. acaule* is self-fertile and in the greenhouse, at least, self-pollinated. Self pollination in this species is facilitated by

the short non-exserted style and the spacial proximity of the stigma to the anther pores, as well as by the occasional development of cleistogamous flowers.

Although little is known with regard to the physiological mechanisms which underlie cleistogamy, certain environmental conditions would appear to favor this mode of reproduction. Thus, according to Davis and Heywood (1963), cleistogamy is of more frequent occurrence in plants which grow in high mountain regions as well as in the far north or far southerly reaches of the world. It is also common at low elevations in plants which have been exposed to prolonged wet weather, drought, cold, heat or deep shade, all conditions associated with a scarcity of insect pollinators. Cleistogamy may function as an aid in the survival of the species in such situations, and especially in cases where normal means of cross-pollination would be prevented.

The ability of *S. acaule* to thrive on the cold, seasonally dry high-altitude grasslands of Peru and Bolivia may be partly due to its predominantly autogamous breeding system, a condition which permits the development of many-seeded berries on plants which would otherwise have few or no insect pollinators, and hence few if any fertile, seed-containing fruits. In evolutionary terms, autogamy may be seen as important in that it favors the formation of genetically homozygous populations. A lack of variability may be advantageous in a uniform environment, as it permits a successful biotype to rapidly colonize its local area. Once a particularly well-adapted biotype of this species has become established, it is capable of maintaining its identity by means of seed obtained through selfing, as well as through vegetative means (i.e., propagation by stolon and tuber formation).

The breeding behavior of the diploid and obligate-outcrossing species most closely related to *S. acaule*, namely *S. canasense*, *S. brevicaule*, and *S. megistacrolobum*, contrasts markedly with that of this species. Although outcrossings within diploid populations may often result in a swarm of genotypically heterozygous seedlings, only few of these may be expected to be well-adapted to any particular habitat, or environment. This type of breeding system, of course, may be advantageous under certain ecological conditions, for it allows the species to adapt itself to changing environments or to colonize a diversity of habitats. Once successful genotypes are established, they may persist for many generations in a particular habitat through a combination of seed and vegetative reproduction. Thus, the diploid species exhibit much flexibility in breeding behavior. Significantly, it is this adaptability which promotes the formation of hybrid swarms between *S. megistacrolobum* and *S. canasense* in Peru and the former species and *S. brevicaule* (a close relative of *S. canasense*) in Bolivia. As pointed out elsewhere, these hybrid swarms frequently contain diploid segregates that are markedly similar in flower, leaf, and habit to *S. acaule* (cf. Ugent 1970-A).

CROSSABILITY OF *S. ACAULE*.--Two frost resistant cultivars grown in the Lake Titicaca region of Peru and Bolivia are known to be naturally occurring hybrids of *S. acaule* and *S. tuberosum*. According to Hawkes (1962), *S. x juzepczukii* ($2n=36$) is formed in crosses between *S. acaule* and *S. tuberosum* Group *Stenotomum* ($2n=24$), while *S. x curtilobum* ($2n=60$) arose from crosses between *S. x juzepczukii* and *S. tuberosum* Group *Andigena* ($2n=48$).

Although the above hybrids are partially sterile, introgression can often take place against strong reproductive barriers, as, for example, in the case of *S. x edinense* and the cultivated potatoes of Mexico (Ugent 1967), and various species of *Tradescantia* (Anderson & Hubricht 1938), *Helianthus* (Heiser 1951), and *Aegilops* (Pazy & Zohary 1965). Natural gene exchange between the hybrids of *S. acaule* and the cultivated potato populations of the Lake Titicaca basin may thus be responsible not only for the great variability of the cultivars grown in this region, but for their generally high frost tolerance as well.

As mentioned earlier, the Argentine triploid, *S. brucheri*, is formed in natural crosses of *S. acaule* with *S. megistacrolobum* (see Hawkes 1963, 1969). *S. acaule* has also been experimentally crossed with *S. megistacrolobum*, and with the two other species of concern to this study, *S. canasense* and *S. brevicaulis* (Ross & Rowe 1972; Okada 1973; Hawkes 1969). Other species within its natural area which it also has been experimentally crossed with include *S. sanctae-rosae*, *S. sparsipilum*, *S. kurtzi-anum*, *S. tarijense*, *S. infundibuliforme*, *S. multidissectum* and *S. sogarandinum*. In addition, *S. acaule* has also been artificially crossed with the following species, none of which, however, are found within its natural range: *S. bulbocastanum*, *S. cardiophyllum*, *S. pinnatisectum*, *S. maglia*, and *S. chacoense*.

According to Hawkes (1969), some of the specimens cited by Correll (1962) as collections of *S. brucheri* may be mis-identified. These he has referred to as naturally occurring hybrids of *S. acaule* and *S. infundibuliforme*. Also, Hawkes reports the species *S. acaule* hybridizes naturally with *S. megistacrolobum* and *S. spegazzinii* in Argentina. Thus, on the whole it would appear that the plants of this section are all very closely related, and that differences in chromosome number are only a minor obstacle to further speciation.

As in the case of other polyploid pillar complexes (cf. Davis & Heywood 1963), crossing can take place here, at and between the various levels of ploidy, and the spontaneous doubling of the chromosome number of diploid hybrid forms is not totally unknown. Since *S. acaule* lacks close relatives at the tetraploid level, we must look toward the diploid species, notably *S. canasense*, *S. brevicaulis*, *S. megistacrolobum*, and their hybrid segregates, for a possible origin.

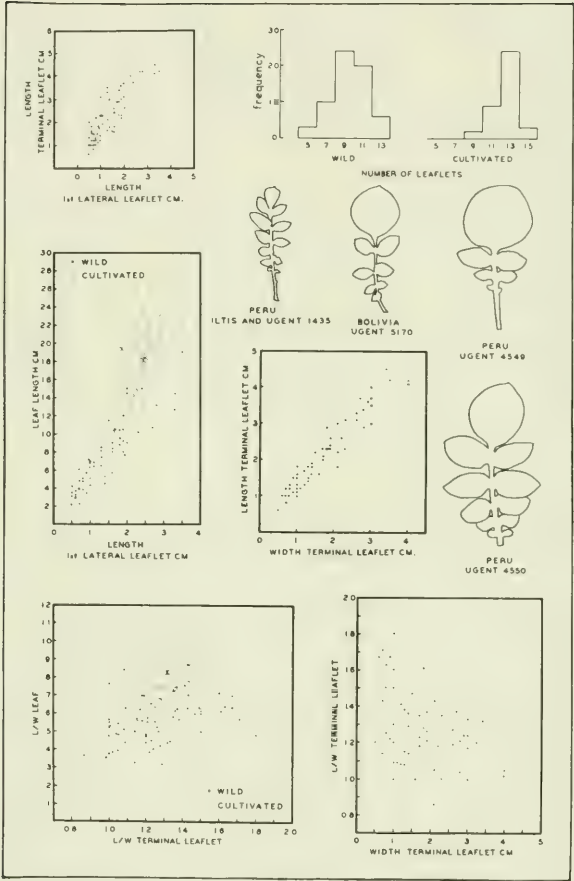
VARIABILITY OF *S. ACAULE*.--The mature terminal leaflets of *S. acaule* are amongst the smallest of any known potato species, and are usually less than 5 cm long and 4 cm wide, and sometimes

as little as 0.5 cm long and 0.5 cm wide (Fig. 2). The size relationships between the terminal leaflets of tetraploid populations of *S. acaule* and diploid populations of *S. canasense*, *S. brevicaule* and *S. megistacrolobum* have been illustrated elsewhere (Ugent 1966). While some differences are found in the shape of the terminal leaflet of *S. acaule*, the general tendency is toward a broadly ovate-elliptic or suborbicular leaflet, much as occurs in hybrid diploid segregates of these taxa (Ugent 1970-A). The extreme sub-orbicular terminal leaflet condition of *S. acaule* may be employed as a useful character in distinguishing this species from similar appearing rosettes of *S. megistacrolobum*.

Populations of *S. acaule* vary considerably in pubescence, length and width of terminal leaflets, number of interjected leaflets and leaf length (Fig. 2). However, the low rosette habit, greatly abbreviated stem and peduncle, and the peculiar non-articulated pedicels (the place of articulation marked only by a ring of purple pigment) are features of this amphidiploid that are relatively constant. These features, plus the distinct chromosome number of *S. acaule*, induced the Russian taxonomists, Juzepczuk and Bukasov (1937), to segregate this single species as the series *Acaulia* of Sect. *Tuberarium*, a classification subsequently maintained by Hawkes (1944, 1956, 1963), Correll (1962) and Ochoa (1962).

Various populations of *S. acaule* vary in leaflet number from 5-13, with a mode of 9. The leaves of cultivated material of this species are distinctly more dissected, varying from 9 to 15 leaflets, with a mode of 13. A study of the scatter-diagrams in Fig. 2 also reveals that the leaves of cultivated material tend to be longer than wild plants, with narrower terminal leaflets and longer lateral leaflets. Noticeable variation is also found between wild and cultivated material with respect to the frequency of interjected leaflets. Although wild plants generally lack interjected leaflets, there may occasionally be 1 or 2, and rarely as many as 11. Cultivated material frequently has 4-10 interjected leaflets and occasionally as many as 17. It is of interest to note that the leaves of the closely related species, *S. canasense* and *S. brevicaule*, though generally more dissected than *S. acaule*, show nevertheless the same tendency for increased dissection under cultivation.

ORIGIN OF *S. ACAULE*.--The manner in which this species arose has long been a matter of conjecture. Both Hawkes (1947, 1963, 1969) and Correll (1962) believe this species to be the South American phytogeographic equivalent of *S. demissum*, a rosette-forming hexaploid ($2n=72$) of central Mexico and Guatemala. However, it is highly doubtful whether these species have had a true vicarious origin or whether they are even distantly related. The two species differ in a number of important morphological characters, have rather dissimilar patterns of



SOLANUM ACAULE

Fig. 2. Morphological variation in *Solanum acaule*.

variability, and do not seem to be closely allied either genetically or ecologically. The reason that authors concluded a relationship can be found in the rosette habit, small stature, and rotate flowers. However, the first two of these characteristics appear to be brought about by convergence. Löve (1954) advocates the use of the term "false vicariads," or "substitution taxa," to describe fully allopatric taxa, such as these, that are heteroploid, of independent origin, and only of superficial morphological similarity.

Bukasov (1960) suggests that series *Acaulia* is of recent polyploid origin and has evolved from South American diploid species. His conception of the phylogenetic affinities of the various potato series is given diagrammatically in the form of a "phylogenetic tree" based upon ploidy level, geography and morphology. In his diagram we find series *Acaulia* and series *Megistacroloba* diverging from a common point on or about the center of an "Andean group" branchlet. This radiates in turn from a forked stem bearing the label "South American branch." The various branches and branchlets are ultimately joined to a common base or stem, thus signifying the monophyletic origin for Sect. *Tuberarium*.

Bukasov's basic premise, Sect. *Tuberarium* as a natural group, can be here agreed to only with the revisions proposed by the present author in another study, especially in regard to the placement of the species in series *Juglandifolia* (see Ugent 1966). Nevertheless, one can not but agree that series *Acaulia* is closely related to series *Megistacroloba*, and especially to the type species *S. megistacrolobum*, the latter also a rosette-forming species and one which has similar distribution and habitat preferences as *S. acaule*. However, the maximum correlation of acaule-like characters are to be found in plants derived from natural crosses of *S. megistacrolobum* with *S. canasense*, or *S. megistacrolobum* with *S. brevicaule*.

Hybrid swarms between *S. megistacrolobum* and *S. canasense* or the very closely related (if not conspecific) *S. brevicaule* nearly always contain segregate forms that are remarkably similar to *S. acaule* in their acaulescent rosette habit, leaf shape and dissection, and broadly rotate flowers. These forms often differ from *S. acaule* only by being diploid, self-sterile, and in having articulated pedicels and slightly larger flowers.

From the study of such hybrid swarms it is suggested here that *S. acaule* may have originated in a complex multi-step process involving: a) hybridization between *S. megistacrolobum* and one or the other (or both) of the two species mentioned above; b) segregation of acaule-like forms; c) doubling of the chromosome number; and, d) differentiation as the result of genetic isolation, self-fertility, inbreeding and natural selection (cf. Ugent 1970-B).

Grazing animals probably facilitate the establishment of hybrid swarms between *S. megistacrolobum* and *S. canasense* in Peru or *S. brevicaule* in Bolivia by introducing their seed into dis-

turbed or artificial habitats. The variant forms which develop in these open habitats may be subject not only to the selective whims of their respective physical environments, but to the selective pressure of the grazing animals which aided in their original establishment as well.

Thus, in areas of intense grazing pressure, hybrid segregates with low rosette forms may persist by clonal propagation for an indefinite number of generations, and may accumulate in yearly numbers through repeated hybridizations and selections. In each successive generation there exists a possibility for the chance formation and fusion of two unreduced gametes, or amphidiploidy.

Once acquired, amphidiploidy may bring about rapid stabilization of acaule-like characteristics, especially as this condition often results in increased self-fertility, inbreeding and genetic isolation from diploid populations.

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SPIRANTHES EMILIAE, NEW SPECIES FROM SIERRA DE LA

MADERA, COAHUILA

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High in the Sierra de la Madera of central Coahuila, Mexico, I. M. Johnston (1944:81) found sterile rosettes that L. O. Williams said "probably" represent orchids of the genus Govenia Lindley. In 1972, Fernando Chiang, Tom Wendt and I saw similar rosettes in the upper part of the Cañón de la Hacienda of the same range. It was not until 1976 that Tom Wendt, Emily Lott and Mike Mispagel found associated with such a rosette one old tattered fruiting stalk lacking flower-parts. Finally, in 1980, Emily Lott and Tom Wendt managed to obtain one fairly intact fruiting stalk and enough flower-parts still attached to enable the reconstruction presented here. The new specimen shows that this plant pertains not to Govenia but to the genus Spiranthes L. Richard not only in the broad sense of Williams (1951) but, I believe, also in the strict sense of those who again dismember this assemblage. I have not been able to match the specimen in the herbarium or in previously published descriptions, and therefore propose it as a new species bearing the name of the enthusiastic and able botanist Emily Lott (born 25 August 1947) to whom I am indebted for making the material available.

SPIRANTHES EMILIAE M. C. Johnst., sp. nov. Vide Fig 1.
Herbae terrestres glabrae 5--8(--10) dm altae. Scapi graciles, 1--3 mm crassi. Folia rosulata late lanceolata vel anguste elliptica tenuissima integra viridia 4--6 cm lata 1--2 dm longa vel longiora petiolis 3--4 cm longis inclusis. Inflorescentia 30--35-flora conferta glabra. Flores adscendentes glabri; sepalum dorsale lanceolatum naviculatum carinatum ca 7 mm longum demum valde arcuatum; sepala lateralalia lanceolata ca 5 mm longa demum reflexa; petala lateralalia ca 7 mm longa tenuia fragilia; labelum hemicylindricum fere integrum ca 4 mm longum; columna ca 2.5 mm longa; rostellum lamelliforme non emarginatum; anthera erecta ca 2 mm longa.

SPIRANTHES EMILIAE M. C. Johnst., new species. Slender, glabrous, terrestrial herbs 5--8(--10) dm tall. Scapes 1--3 mm thick with several scarious semiamplexicaul lanceolate acuminate bracts. Leaves in a basal rosette, broadly lanceolate to narrowly elliptic, very thin, entire, green, 4--6 cm wide, 1--2 dm long or longer of which the lower 3--4 cm represents a narrow petiole-like base. Inflorescence glabrous, rather dense (spiral disposition of flowers not evident), ca 30--35-flowered, ca 13 mm long and after anthesis becoming 2 cm thick; flowers ascending even in fruit, perhaps purplish green in part; dorsal sepal lanceolate, boat-shaped, keeled, ca 7 mm long, after anthesis becoming strongly arcuate-erect; lateral sepals lanceolate, ca 5 mm long, after anthesis usually reflexed over back of fruit; lateral petals ca 7 mm long, thin, fragile, each about half overlapping with and joined to dorsal sepal; lip ca 4 mm long, essentially entire or very obscurely 3-lobed, forming a trough under and around the column; column ca 2.5 mm long; rostellum lamellar, truncate or very subtly rounded, not emarginate; anther erect, ca 2 mm long, after dehiscence ascending or erect and connected to column by a thin membrane ca 0.5 mm long.

HOLOTYPE: MEXICO, Coahuila, Municipio de Cuatro Ciénegas, Sierra de la Madera, Cañón del Agua, 27°3' N. latitude, 102°24' W. longitude, common in creek with little running water, 1750--2200 m (this one at 1865 m), associated with Quercus gravesii Sudworth, Acer grandidentatum Nuttall, Prunus, Cornus, etc., 14 August 1980, Emily Lott and Tom Wendt P-22 (TEX, unicate).

PARATYPE: same mountain-range, Cañón Los Olmos at junction of eastern and western forks and just below, mesic limestone canyon oak-woodland with Quercus muehlenbergii Engelman, Q. gravesii Sudworth, Pinus arizonica Engelman, Cupressus arizonica Greene, Ceanothus coeruleus Lagasca, Acer, Garrya, Rhamnus betulifolia Greene, Quercus glaucooides Martens et Galeotti, Fraxinus cuspidata Torrey and Salvia regla Cavanilles, 1920 m, 27 September 1976, T. Wendt, E. Lott and M. Mispagel 1793 (TEX, unicate).

As stated above, I have been unable to match this species. Among the specimens of *Spiranthes* that I have had available for study the one that seems to come closest in form to *S. emiliae* is an Ecuadorian specimen of *S. reichenbachiana* Garay et Dunsterville. But that species differs from *S. emiliae* in so many particulars of size, shape, positioning and pubescence of flowers and leaves that a detailed comparison would serve no good purpose here. An estimate of the true relationships of *S. emiliae* will have to await the efforts of some monographer brave enough to tackle this congeries.

I am indebted to the enthusiastic and knowledgeable orchidist Mr. Jim Folsom for help in interpreting the specimens and in locating literature. Work on this orchid represents some of the final throes of the compilation of the Chihuahuan Desert Flora

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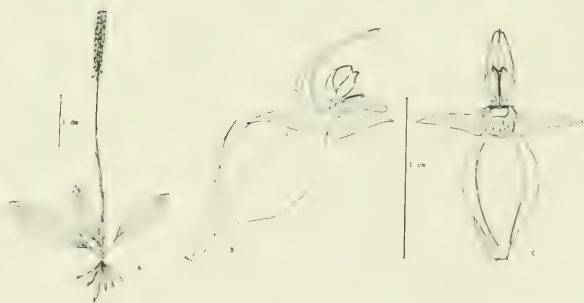


Fig. 1. *Spiranthes emiliae* M. C. Johnst. drawn from the holotype. A. Habit-sketch. B. Lateral view of almost mature fruit with perianth and column still attached, right-hand sepal shown reflexed, left-hand sepal spreading, anther elevated and empty. C. Front view of B with lip slightly depressed to reveal column.

REALIGNMENTS IN THE DICHANTHELIUM
ACUMINATUM COMPLEX (POACEAE)

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When Gould and Clark (1978) placed 46 names in synonymy under Dichanthelium acuminatum (Sw.) Gould & Clark a cycle of "lumping - splitting - lumping" spanning a century was nearly completed. Their broad circumscription of this taxon approached the view held as late as the sixth edition of Gray's Manual (Watson and Coulter, 1889) which treated this complex and more as a single species, Fanicum dichotomum L. In the two decades following this edition 36 new species were named in the complex, most of them by Nash (1896, 1897, 1898, and 1903) and Ashe (1898 and 1900). Hitchcock and Chase (1910) recognized 24 species for this group in their revision of North American Fanicum. Although six new species were named in the next four decades, the trend toward reduction in the number of recognized species is evident in the works of Deam (1929), Fernald (1921, 1934, and 1950), Shinnars (1944), Pohl (1947), Gleason (1952), Steyermark (1963), Radford et al (1964), and Lelong (1965).

This exceptional range of taxonomic treatments can be attributed to the problems created for the taxonomist by the reproductive biology of these grasses. Reproduction is amphigamous (sensu Hackel as reviewed by Uphoff, 1938) with autogamy predominating (Lelong, 1965; Spellenberg, 1975a). The autogamous reproduction produces innumerable essentially homozygous local populations or microspecies, some of which have incorporated translocations or inversions relative to other populations. An exceptional range of variation in such traits as habit, pubescence, and spikelet length is maintained in the complex probably through inbreeding. Sporadic outcrossing introduces new traits into inbred populations leading to new homozygous lines. Spellenberg (1968, 1970, 1975b) synthesized an array of hybrids between populations and between recognized species. He noted that the fertility of the hybrids was generally low and that it tended to be lowest in hybrids between plants widely separated geographically or morphologically, but that successive generations of hybrid derivatives showed increasing fertility. These observations reinforce the views of some workers in this group that natural hybridization is sufficiently extensive to blur distinctions between species or microspecies and to produce a reticulum of intergrading forms between described taxa. Environmentally induced alterations of many of the diagnostic traits further obscure distinctions between taxa.

A satisfactory taxonomic treatment, if such is possible in a large amphigamous complex, will require extensive work with synthetic hybridization, population studies, and transplant garden or growth chamber observations. Lelong's study on variation and Spellenberg's work with artificial hybridization are major contributions, but are limited to portions of the complex. Thus the taxonomy of the D. acuminatum complex still rests to a large extent on the study of herbarium specimens and on personal judgment.

Until recently the D. acuminatum complex was called the Panicum lanuginosum complex. A range of treatments and combinations were available to the taxonomist based on the assumptions that the group belonged in the genus Panicum and that P. lanuginosum was the oldest valid binomial in the complex. In 1974 Gould raised the subgenus Dichanthelium of Panicum to a genus, supported by the work of Hsu (1965), Clark and Gould (1975), and Brown and Smith (1975). In 1978 Gould and Clark, noting that P. acuminatum predated P. lanuginosum, published D. acuminatum as a new combination and assigned most of the P. lanuginosum complex to varieties of this species. Since I believe that their treatment overlooks some of Spellenberg's and Lelong's work and fails to recognize certain species and varieties which I and many previous workers consider to be worthy of recognition I am compelled to make several modifications to their work.

Key to the species:

1. Peduncle, panicle axis, and sheaths of primary (vernal) culm puberulent with hairs about 0.1 mm long, sometimes also pubescent with longer hairs, but never grayish-villous.
2. Spikelets 0.8-1.1 mm long; blades usually less than 4 mm wide and 4 cm long; sheaths sparsely puberulent, lacking papillose-based longer hairs..... D. wrightianum
2. Spikelets 1.2-1.7 mm long; mid-culm blades more than 4 mm wide and 4 cm long; sheaths with some papillose-based hairs 2 mm long or more.
3. Mid-culm blades nearly erect, glabrous above, generally 4-7 mm wide and 4-7 cm long; sheaths sparsely pilose with hairs 1-2 mm long; ligule of hairs 1-2.5 mm long intermixed; spikelets 1.2-1.4 mm long..... D. leucothrix
3. Mid-culm blades ascending-spreading, pilose above, generally 3-5 mm wide and 3-5 cm long; sheaths pilose with hairs 2-4 mm long; ligule a ring of hairs approximately 0.7 mm long differentiated from the pseudoligule of scattered hairs 3-4 mm long; spikelets 1.3-1.7 mm long..... D. meridionale
1. Peduncle, panicle axis, and sheaths of primary (vernal) culm glabrous, or pilose, or grayish-villous with some shorter hairs 0.2-0.5 mm long, but not puberulent.
4. Ligule of hairs 1-2.5 mm long; sheaths glabrous; blades firm, the lower nearly erect.

5. Panicle dense and narrow, about one-fourth as wide as long, bearing 250 or more spikelets, the majority of these on pedicels less than 1.5 mm long; spikelets 1.4-1.6 mm long; fertile floret pointed, sharply acute at apex..... D. spretum
5. Panicle more open, more than one-half as wide as long, bearing about 100-150 spikelets, these mostly on pedicels 2-5 mm long; spikelets 1.2-1.5 mm long; fertile floret rounded to acute, not pointed at apex.....
..... D. longiligulatum
4. Ligule with some hairs 3-5 mm long; sheaths pilose, villous, or nearly glabrous; blades not especially firm, the lower usually spreading-ascending.
6. Sheaths and culms with straight horizontal to retrorse hairs, the longer ones exceeding 4 mm; hairs 0.2-1 mm long absent; spikelets 1.8-2.5 mm long.....
..... D. villosissimum
6. Sheaths and culms glabrous, or ascending pilose to hispid, or grayish-villous with a dense tangled mixture of slender hairs, a few approaching 4 mm, but usually with short hairs 0.2-1 mm long; spikelets 1.2-2.0 mm long..... D. acuminatum

Dichantherium wrightianum (Scribner) Freckmann, comb. nov.

Basionym: Panicum wrightianum Scribner, U. S. D. A. Div.

Agrost. Bull. 11: 44. 1898.

Synonyms include D. acuminatum (Sw.) Gould & Clark var.

wrightianum (Scribn.) Gould & Clark.

This species seems to be as closely related to some members of the Hitchcock and Chase group "Ensifolia" as to D. acuminatum from which it differs by its small, delicate culms, puberulence, relatively short ligule, and tiny spikelets.

Sandy peat or muck. Coastal Plain, Cuba, and Belize.

Dichantherium leucothrix (Nash) Freckmann, comb. nov.

Basionym: Panicum leucothrix Nash, Bull. Torrey Bot. Club

24: 41. 1897.

Gould and Clark placed this name in synonymy under D. acuminatum var. implicatum (Scribn.) Gould & Clark. It can be distinguished from D. acuminatum by its puberulent sheaths and shorter ligule hairs (longest hairs 2.5 mm vs. longest hairs more than 3 mm long).

Wet sand, muck, or peat. Coastal Plain, Cuba, West Indies, and northern South America.

Dichanthelium meridionale (Ashe) Freckm. Phytologia 39: 270. 1978.

Synonyms include P. albemarlense Ashe.

Gould and Clark placed this name in synonymy under D. acuminatum var. implicatum. This species differs from that taxon by puberulent peduncles, panicle axes, and sheaths; by greatly reduced uppermost blades (less than 4 mm wide and 4 cm long); and generally by its exceptionally slender culms. The ligule consists of a tight ring of hairs about 0.7 mm long with scattered hairs 3-4 mm long slightly distal to it and forming an apparent pseudoligule in contrast to the ligule or pseudoligule of D. acuminatum which is composed of a dense mixture of hairs of varying length, the longest more than 3 mm but not separated from the shorter hairs. It should be noted that secondary (autumnal) shoots of D. acuminatum generally produce short hairs about 0.2 mm long among the longer hairs and are frequently mistaken for D. meridionale. These shorter hairs are slightly longer than the puberulence of D. meridionale, but accurate identification requires an examination of the remaining parts of the primary shoots for the presence or absence of puberulence.

Sand and sandy shores. Eastern United States, most common on the Atlantic coastal plain and inland through the Great Lakes.

Dichanthelium spretum (Schultes) Freckmann, comb. nov.

Basionym: Panicum spretum Schultes, Mant. 2: 248. 1824.

Synonyms include D. acuminatum var. densiflorum (Rand & Redfield) Gould & Clark.

This species is readily distinguished from the others in the complex by the combination of glabrous peduncles, panicle axes, and sheaths together with the narrow panicles of numerous spikelets on short pedicels, and the sharply-pointed fertile florets. It has shorter ligules and firmer, more strongly ascending lower leaves than D. acuminatum var. lindheimeri (Nash) Gould & Clark.

Peat and wet sand. Coastal Plain and at scattered locations inland to Indiana.

Dichanthelium longiligulatum (Nash) Freckmann, comb. nov.

Basionym: Panicum longiligulatum Nash, Bull. Torrey Bot. Club 26: 574. 1899.

Synonym: D. acuminatum var. longiligulatum (Nash) Gould & Clark.

This species can be confused with *D. spretum*, sparsely hairy *D. leucothrix*, and *D. acuminatum* var. *lindheimeri*. It differs from *D. spretum* by its wider, more open panicles with fewer spikelets on longer pedicels, and by the less acute fertile florets; from *D. leucothrix* by completely glabrous sheaths; and from *D. acuminatum* var. *lindheimeri* by shorter spikelets (usually less than 1.4 mm long vs. usually more than 1.4 mm), firmer, more strongly ascending lower leaves, shorter ligules, and often taller culms (usually more than 80 cm tall vs. usually less than 80 cm) with internodes more than twice as long as the sheaths.

Swamps and pine barrens. Coastal Plain and Central America.

Dichantherium villosissimum (Nash) Freckm. Phytologia 39: 270. 1978.

Synonyms include *D. acuminatum* var. *villosum* (A. Gray) Gould & Clark.

Gould and Clark placed *P. pseudopubescens* Nash in synonymy under *D. acuminatum* var. *villosum*. Fernald (1950) and Gleason treated it as a variety of *P. villosissimum* Nash. It differs by its stiff, ascending hairs on culm and sheath instead of slender spreading hairs. The poorly known *P. benneri* Fern. may be another form of *P. pseudopubescens*. I withhold judgment on both pending further study. Fernald and Gleason treated *P. scoparioides* Ashe as a variety of *P. villosissimum*. I agree with Lelong and others that it probably consists of a group of nearly sterile hybrids between *D. oligosanthos* (Schult.) Gould and *D. acuminatum*. Gould and Clark placed *P. euchlamydeum* Shinners in synonymy under *D. acuminatum* var. *villosum* and also under *D. sabulorum* (Lam.) Gould & Clark var. *patulum* (Scribn. & Merr.) Gould & Clark. It does not seem to be closely related to the former because its sheath and culm vestiture consists of stiff, ascending hairs along with puberulence and its spikelets and very stiff panicle branches are dark red.

Key to the varieties of *D. villosissimum*:

1. Spikelets 2.1-2.5 mm long; panicle 5-10 cm long with fairly stiff branches; largest blades generally more than 6 mm wide..... var. *villosissimum*
1. Spikelets 1.8-2.1 mm long; panicle 4-6 cm long with flexuous branches; blades generally less than 6 mm wide..... var. *praecocius*

Dichantherium villosissimum (Nash) Freckm. var. *villosissimum*

This variety is similar to *D. acuminatum* var. *acuminatum* with some intergradation occurring. The great majority of specimens can be separated by the following key:

1. Spikelets 2.1-2.5 mm long; first glume 0.7-1.1 mm long, about one-third as long as the spikelet; longest hairs on sheaths and culms 4-5 mm long, relatively straight, horizontally spreading to somewhat retrorse; sheaths lacking hairs less than 1 mm long; panicles two to three times compound, the major branches rebranching once or twice.....
..... D. villosissimum var. villosissimum
1. Spikelets 1.2-2.0 mm long; first glume 0.3-0.8 mm long, about one-fourth as long as the spikelet; longest hairs on sheaths and culms 3 or sometimes 4 mm long, curved or wavy, variously ascending to reflexed, somewhat tangled to matted, very dense and giving grayish color to sheath; sheath usually with shorter hairs, 0.2-1 mm long also present; panicle frequently four or more times compound, the longer branches rebranching three times.....
..... D. acuminatum var. acuminatum

Sandy soil and open woodlands. Massachusetts to Florida and Texas; Mexico; Central America.

Dichanthelium villosissimum var. praecocius (Hitchc. & Chase) Freckm. *Phytologia* 39: 270. 1978.

This variety intergrades with var. villosissimum in eastern Texas, Oklahoma, northern Arkansas, and southern Missouri. A few specimens in the northern part of its range suggest limited intergradation with D. acuminatum var. fasciculatum.

Tall-grass prairies and open woodlands. Michigan and Minnesota south to Nebraska, northeastern Texas and southern Illinois.

Dichanthelium acuminatum (Sw.) Gould & Clark. *Ann. Missouri Bot. Gard.* 65: 1121. 1978.

Gould and Clark recognized eight varieties in this species encompassing all of the taxa treated in this paper. Four of the eight varieties I have treated above as distinct species (D. villosissimum for var. villosum, D. wrightianum for var. wrightianum, D. spretum for var. densiflorum, and D. longiligulatum for var. longiligulatum). I agree with their treatment of var.s lindheimeri and thurwii. I do not agree with their handling of the western U.S. hot-springs or geyser taxa which Spellenberg studied or with their handling of the hairy, non-robust component which comprises the most abundant and most variable part of the complex. Gould and Clark divided this latter group into var. implicatum (Scribn.) Gould & Clark and var. acuminatum, separating them entirely on the basis of spikelet length (1.2-1.5 mm vs. 1.6-2.5 mm), admitting that this separation was arbitrary. Shinnars and Pohl have both shown that there is a continuity in spikelet lengths in this complex with the mode of the curve for the distribution of specimens according to spikelet

length at about 1.6 mm. The two tables presented below show a tally of MIL, USWF, and WIS specimens by spikelet length. Table number one includes all specimens of varieties acuminatum and implicatum according to Gould and Clark's key (including specimens which I identify as D. commonsianum (Ashe) Freckm. var. euchlamydeum (Shinners) Freckm., D. leucothrix, D. meridionale, and D. acuminatum var.s sericeum and thermale). Table number two tallies the specimens of the three most common varieties of D. acuminatum as identified according to the keys presented in this paper.

Spikelet length in mm	Table No. 1. Specimens of <u>D. acuminatum</u> var.s <u>acum-</u> <u>inatum</u> and <u>implicatum</u> sensu Gould and Clark.			Table No. 2. Specimens of three <u>D. acuminatum</u> var.s sensu Freckmann.		
	Wis. collec- tions	Out- of- state	Total	<u>acum-</u> <u>inatum</u>	<u>fasci-</u> <u>ulatum</u>	<u>lind-</u> <u>heim-</u> <u>eri</u>
1.2		2	2	1		
1.3	9	19	28	1	15	6
1.4	72	73	145		113	33
1.5	161	168	329	4	274	66
1.6	198	159	357	11	276	43
1.7	106	119	225	17	190	23
1.8	38	70	108	18	82	6
1.9	13	20	33	4	23	
2.0	10	5	15	2	9	
2.1	5	6	11		5	
2.2	17	11	28			
2.3	18	9	27			
2.4	23	12	35			
2.5	5	2	7			

It is evident from both tables that the separation of varieties entirely on the distinction of spikelets 1.6 mm or more vs. 1.5 mm or less is completely unsatisfactory. The type and to a lesser extent the distribution and density of hairs seem to provide a better set of characters. These traits are primarily under genetic control, although transplant studies indicate that stoutness is partially influenced by environmental factors and that hairs tend to break off or become more matted during the course of the growing season.

Key to the varieties of D. acuminatum:

1. Primary (vernal) culms usually less than 30 cm tall; mid-culm sheaths nearly as long as the internodes, their blades at least one-eighth as wide as long, generally more than 6 mm wide and less than 6 cm long..... var. sericeum
1. Primary (vernal) culms usually more than 30 cm tall; mid-culm sheaths about one-half as long as the internodes, their blades generally more than eight times as long as wide and more than 6 cm long.
 2. Sheaths and internodes of primary culms gray-villous with a dense, tangled to matted mixture of slender hairs 2-4 mm long, variously ascending, spreading, and retrorse, arising from small papillae or non-papillose, plus shorter hairs 0.2-1 mm long; winter rosette blades large, some exceeding 5 cm in length.
 3. Primary culms robust, generally more than 60 cm tall and 2 mm thick; panicle contracted, usually more than 8 cm long and less than one-half as wide..... var. thurowii
 3. Primary culms not exceptionally robust, rarely more than 60 cm tall or more than 1.3 mm thick; panicle broadly ovoid, less than 8 cm long and more than one half as wide.
 4. Primary panicles at fruiting stage exerted on peduncles less than 6 cm long; blades erect, those of late season lacking cilia on upper half..... var. thermale
 4. Primary panicles at fruiting stage generally exerted on peduncles more than 10 cm long; blades ascending to spreading, bearing cilia most of their length.....
..... var. acuminatum
 2. Sheaths and internodes of primary culms glabrous or papillose-pilose to hispid, with ascending straight hairs 1-3 mm long; winter rosette blades usually broadly ovate, spreading, 2-5 cm long.
 5. Peduncle and panicle axis pubescent to pilose; sheaths papillose-pilose to hispid, the hairs tending to break off, but leaving evident papillae..... var. fasciculatum
 5. Peduncle and panicle axis glabrous; sheaths, or at least middle portion of sheaths lacking hairs or papillae.....
..... var. lindheimeri

Dichanthelium acuminatum (Sw.) Gould & Clark var. acuminatum

Synonyms include P. lanuginosum Ell., P. auburne Ashe, and P. olivaceum Hitchc. & Chase.

Several names which Gould and Clark placed in synonymy here I assign to other taxa: P. thermale = var. thermale; P. tennesseense Ashe, P. huachucae Ashe, P. occidentale Scribn., P. subvillosum Ashe, P. pacificum Hitchc. & Chase, P. languidum Hitchc. & Chase, P. brodiei St. John, and P. lassenianum Schmoll = var.

fasciculatum; and P. ferventicola Schmoll - var. sericeum. P. benneri Fern. is discussed under D. villosissimum. P. shastense Scribn. & Merr. is a hybrid between D. acuminatum and D. oligosanthos (Spellenberg, 1970) and the same is probably true of P. scoparioides Ashe. I am not able to render a decision on the poorly known P. glutinoscabrum Fern., but I suggest that it is a hybrid between a member of the D. acuminatum complex and D. scoparium (Lam.) Gould - the latter contributing the genes for height and viscid sheaths.

This variety represents the densely hairy end of the spectrum which grades into var. fasciculatum and to var. lindheimeri at the glabrous end. Nevertheless the majority of specimens of this variety show a correlation among the traits given in the key, making the distinction between these three varieties more satisfactory than the acuminatum-implicatum distinction based on spikelet length.

Disturbed areas and open woodland, on thin, often sandy or clayey soils. Southeastern U. S., mostly on the Coastal Plain; West Indies; Mexico, Central America, and northern South America.

Dichanthelium acuminatum (Swartz) Gould & Clark var. thermale (Bolander) Freckmann, comb. nov.

Basionym: Panicum thermale Bolander, Calif. Acad. Sci. Proc. 2: 181. 1862; Dichanthelium lanuginosum (Ell.) Gould var. thermale (Bolander) Spellenberg. Madrono 23: 151. 1975.

On mineralized crust of warm, moist soil at The Geysers, Sonoma Co., California.

Dichanthelium acuminatum (Swartz) Gould & Clark var. sericeum (Schmoll) Freckmann, comb. nov.

Basionym: Panicum ferventicola Schmoll var. sericeum Schmoll, Madrono 5: 92. 1939.

Synonyms: P. ferventicola Schmoll, P. ferventicola var. papillosum Schmoll, and D. lanuginosum (Ell.) Gould var. sericeum (Schmoll) Spellenberg.

Usually on warm or hot ground around geysers and hot springs. Rocky Mountains from Banff to Yellowstone National Park to Bighorn Co., Wyoming.

Spellenberg (1968 and 1975b) discussed both varieties in detail, noting that each variety retained distinguishing traits under greenhouse transplant conditions.

Dichanthelium acuminatum (Swartz) Gould & Clark var. thurowii (Scribner & Smith) Gould & Clark. Ann. Missouri Bot. Gard. 65: 1125. 1978.

Dry, open woodlands. Georgia to east Texas.

Dichanthelium acuminatum (Swartz) Gould & Clark var. fasciculatum (Torrey) Freckmann, comb. nov.

Basionym: Panicum dichotomum L. var. fasciculatum Torrey, Fl. North and Mid. U. S. 145. 1824.

Synonyms include P. implicatum Scribn., P. tennesseense Ashe, P. huachucae Ashe, P. occidentale Scribn., P. subvillosum Ashe, P. huachucae var. silvicola Hitchc. & Chase, P. pacificum Hitchc. & Chase, P. languidum Hitchc. & Chase, P. brodiei St. John, P. lassenianum Schmoll, D. lanuginosum (Ell.) Gould var. fasciculatum (Torr.) Spellenb., and D. acuminatum var. implicatum (Scribn.) Gould & Clark.

This variety constitutes the most variable component of the complex. It intergrades with varieties acuminatum and lindheimeri and apparently hybridizes with D. oligosanthos, D. dichotomum (L.) Gould, D. boreale (Nash) Freckm., D. meridionale, D. columbianum (Scribn.) Freckm., D. sphaerocarpon (Ell.) Gould, and probably with several other species. Certain combinations of characters occur more frequently and have encouraged workers to accept some of the species listed above, including P. implicatum (numerous small spikelets, large multicomound panicles, and long erect hairs on upper blade surfaces); P. huachucae (larger spikelets, less compound panicles, short appressed hairs on blades); P. tennesseense (glabrous blades); and P. subvillosum (larger spikelets with relatively long first glumes, leaves and branches concentrated at base of plant). However, so many specimens show other combinations of traits that maintaining these as species or varieties requires annotating a high percentage of specimens as "atypical" or "intermediate."

Disturbed areas, open or cut-over woods, thickets, grasslands, sedge meadows, shores, etc., frequently on soils with upper horizon removed or scarred. Temperate North America, more discontinuous in the West and tending to be replaced by var. acuminatum in warm temperate and subtropical regions.

Dichanthelium acuminatum (Swartz) Gould & Clark var. lindheimeri (Nash) Gould & Clark. Ann. Missouri Bot. Gard. 65: 1127. 1978.

Synonyms include P. lanuginosum var. septentrionale Fern. and D. lanuginosum var. lindheimeri (Nash) Freckm.

This variety represents the glabrous extreme of var. fasciculatum. Hybrids between D. acuminatum and either D. dichotomum or D. boreale are frequently identified as this variety; these hybrids usually have purplish spikelets nearly 2.0 mm long, wide, spreading blades, and a clear distinction between the short ring of ligule hairs and the scattered long hairs.

Same habitats as var. fasciculatum but with a greater preference for moist areas. Same range as var. fasciculatum.

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ADDITIONAL NOTES ON THE GENUS *GHINIA*. II

Harold N. Moldenke

GHINIA Schreb.

Additional & emended synonymy: *Kaempferia* Houst ex Spach, Hist. Nat. Veg. 9: 227, in syn. 1840 [not *Kaempferia* L., 1737]. *Guinea* Millsp. ex Mold., Phytologia 47: 449, in syn. 1981.

Additional & emended bibliography: Neck., Elem. Bot. 1: 355--356. 1790; Sw., Fl. Ind. Occ. Prod. 2: 1087--1090, pl. 21 [sup.]. 1800; Meisn., Pl. Vasc. Gen. 2 [Comment.]: 200 & 206. 1840; J. C. Willis, Dict. Flow. Pl., ed. 5, 638 (1925), ed. 6, imp. 1, 638 (1931), ed. 6, imp. 2, 638 (1948), ed. 6, imp. 3, 638 (1951), ed. 6, imp. 4, 638 (1955), ed. 6, imp. 5, 638 (1957), and ed. 6, imp. 6, 638. 1960; Sw., Nov. Gen. Sp. Pl., imp. 2, 94. 1962; Liogier, Rhodora 67: 349. 1965; G. Taylor, Ind. Kew. Suppl. 13: 73. 1966; Mold., Phytologia 47: 447--461, 504, 507, 508, 511, & 512. 1981.

GHINIA CURASSAVICA (L.) Oken

Emended synonymy: *Ischnia verbenacea* P.DC. ex Meisn., Pl. Vasc. Gen. 2 [Comment.]: 206. 1840.

Additional bibliography: Meisn., Pl. Vasc. Gen. 2 [Comment.]: 206. 1840; Mold., Phytologia 47: 448--458. 1981.

Meisner (1840) follows DeCandolle in placing the genus *Ischnia* P.DC. and *I. verbenacea* P.DC. in the *Pedaliaceae*. Taylor (1966) continues this erroneous disposition of the genus and species.

GHINIA SPICATA (Aubl.) Mold.

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312--316, 649, 650, & 653. 1977; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 24. 1979; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 189. 1980; Mold., *Phytol. Mem.* 2: 71, 74, 78, 115, 122, 124, 126, 142, 354, 380, 405, & 548. 1980; Mold., *Phytologia* 47: 409 & 416. 1981.

Illustrations: Aubl., *Hist. Pl. Guian. Franç.* 2: pl. 268. 1775; Sw., *Fl. Ind. Occ. Prod.* 2: pl. 21. 1800; Gaertn. f., *Fruct. Sem. Pl.* 3: pl. 213 (inf.). 1805; Poir. in Lam., *Encycl. Méth. Bot.* 3: pl. 542. 1819; Gibson, *Fieldiana Bot.* 24 (9): 229, fig. 45. 1970; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 15: 27, [fig. 6]. 1975; López-Palacios, *Fl. Venez. Verb.* [313] & [315]. 1977.

A slender, erect, branched, perennial herb, to about 1.5 m. tall, usually lower; branches and branchlets spreading, strict or subarcuate, more or less minutely pilose-hirtellous with short uncinuate hairs, acutely tetragonal and more or less margined, the leaf-bearing sides 2-costate, alternately 3-striate and 3-sulcate, the costae and margins pale and thick; leaves decussate-opposite; petioles very slender, 3--6 mm. long, rather densely hirsute; leaf-blades green, small, thinly chartaceous, ovate or subovate to subrotund-elliptic, 7--16 mm. long, 3--12 mm. wide, often plicate or slightly so, apically obtuse (in outline), basally subtruncate or truncate to subcuneate, marginally rather coarsely incised- or subincised-serrate with sharply acute teeth and ciliate, rather sparsely hirsute or pilose-hirsute with scattered hairs above, more densely hirsute (especially along the venation) beneath, penninerved, often plicate at the vein confluence; inflorescence racemiform, axillary, not truly opposite but regularly unilateral on the branches, solitary, 2.5--8 cm. long, 2--8-flowered, ascending; rachis tetragonal, filiform, finally strict; puduncles equaling the subtending leaf; flowers distant, pedicellate; pedicels about 2 mm. long, uncinuate-pilose; calyx green with darker veins, tubular, membranous, 5-plicate, during anthesis about 4 mm. long and 1--1.5 mm. wide, the herbaceous ribs excurrent into subulate teeth 1 mm. long; corolla small, blue or bluish to lavender, violet, or occasionally purplish-white, about 7 mm. long; fruiting-calyx spreading-campanulate, about 4 mm. long and wide, conspicuously 5-costate, the ribs prominent and projecting about 1 mm. at their apex, thin and translucent between the ribs, sparsely uncinuate-pilose (especially on the ribs); drupes small, glossy black and juicy when mature and fresh, turbinate, muticous (not spinose, the spines being represented by several small bumps at the very obtuse or rounded to subtruncate and slightly depressed apex, often with a rudimentary style-base), about 3 mm. long and wide, glabrous.

The species ranges from Central America, through Venezuela and the Guianas, to tropical Brazil; sometimes cultivated. It is based on an unnumbered Aublet collection from "à l'île de Cayenne, sur les bords des sentiers & des chemins" in French Guiana. This rather widespread species occurs in open places and scrubland, as well as on pine ridges. The name, *Tamonea mutica* Sw., is merely an illegitimate substitute name for the *T. spicata* of Aublet.

Collectors, on the labels accompanying their specimens, describe

this plant as a small, erect, branching, bushy herb, 0.3--1.5 m. tall, with a woody base, or a low shrub or subshrub, of weedy habit, the stems to 1.2 cm. in diameter, the leaves very small, plicate or slightly so, slightly rugose, varying from rich-, deep-, or dark-green to mid- or dull-green above, and with "sulcate nerves" [=impressed veins], pale- or gray-green beneath, the calyx green with darker veins, and the fruit green or greenish and "turning black", glossy, and juicy when ripe. This "black" and "juicy" character of the fruit, so often mentioned by collectors and authors, is certainly not evident on herbarium specimens!

The corollas are described as having been "blue" on Croat 24040, Eiten & Eiten 4178, Gentle 4134, Lanjouw & Lindeman 1764, Liesner & Dwyer 1429, Schipp 612, Seymour & Robbins 5820, Splitgerber 744, and Wullschlägel 784, "dark-blue" on Steyermark & al. 105948, "bluish" on Broadway 126, "lavender" on Croat 23513, "violet" on Contreras 547 and Tamayo 2683, "lilac" on Steyermark 45247, "amethyst" on Ruiz-Terán & López-Palacios 11577, "mauve" on Harley 17497, "mauve with darker lines on lower lip and yellow throat" on Harley 15881, "blue or amethyst with a yellow throat" on Ruiz-Terán & López-Palacios 11496, "rather dark violet-blue with a reddish-orange throat" on Harley 17560, "purple" on Gentle 8482 & 9473, "bright-purple" on Forest Dept. Br. Guian. B.404, "violet with darker lines in the throat" on Harley 18491, "violet, white at base" on Davidse & al. 4633, "pinkish" on Gentle 6687, "pinkish-white" on Gentle 6687, and "whitish" on Aristeguieta 5898.

Collectors have found this plant growing in sandy soil, parched ground, savannas and the margins of savanna clearings, rocky areas and igneous outcrops along streams, the edges of hammocks, open places and waste ground along streams, scrubland, pinal, caatinga, and restinga, on low pine ridges, at the edge of hard-bush, on large igneous rock outcrops, in shady places and woods, in high evergreen rainforests, and in "evergreen rainforest with disturbed margins at the seashore", at altitudes of sealevel to 950 meters, in flower in every month of the year and in fruit from January to March and May to September.

The Eitens encountered it "in open stony ground on descent from low plateau in disturbed chapada". Davidse and his associates found it "in *Trachypogon* savannas on low hills with very widely spaced *Curatella americana*." Harley and his associates encountered it in "mixed restinga vegetation on sand with high forest, low trees, and shrubs, and sedge meadows with open wet areas on white sand", "in coastal evergreen forest with disturbed margins, rocks by the sea, and semi-cultivated ground", in "high coastal evergreen forest in heavy loam soil", and in "waste ground by river with damp grassland and scattered woodland". Schipp, who erroneously describes the fruits as "berries", reports it only occasional in Belize. Gentle 8482 is accompanied by a label reading "small tree" -- obviously an error. Tamayo describes the plant as "planta fruticosa, rastrera-erecta". Ruiz-Terán & López-Palacios

refer to it as an "Hierba sufruticulosa, repente, ramificada, las ramas dispuestas de modo más o menos simétrico en varias direcciones radiales, 30--50 cm. de diámetro. Tallos 4-gonos. Hojas opositidecussadas, pequeñas."

Raeuschel (1797) erroneously records the species from Jamaica ["Iamaica"]. Steyermark cites his no. 89285 from Venezuela -- the Steyermark (1968) reference in the bibliography (above) is sometimes erroneously cited as "1969".

Loudon (1830) and Sweet (1830) tell us that this plant was introduced into cultivation in England in 1824 from "Trinidad", calling it the "spiked tamonea". Under the name *Tamonia mutica* Pers. they record its introduction into England in 1820 and call it the "awnless tamonia". Willdenow (1797) uses the German popular name, "wehrlose Traubennuss".

Kunth (1823) says of the species: "Crescit in Provincia Novae Andalusiae, prope Quetepe et Cumana", describing it merely as having "foliis hispido-pilosis; fructibus inermibus". Schauer (1847, 1851) cites Blanchet 403, Lhotzky s.n., Salzmann 434, and Sellow s.n. from Bahia, Brazil, "U. & B." s.n. [Humboldt & Bonpland?] and Otto 983 & 1041 from Venezuela, and Aublet s.n. & Perrottet s.n. from French Guiana.

López-Palacios (1977) cites Aristeguieta 5898, Cortés s.n., Grosourdy Cat. 13 s.n., Otto 984 & 1041, Ruiz-Terañ & López-Palacios 11577, Steyermark 57672 & 89285, and Tamayo 2683 from Bolívar, Venezuela. He comments (1975) that the species is "registrada hasta la fecha solamente para Bolívar y Monagas [in Venezuela], y que desde el punto de vista taxonómico no ofrece dificultad ninguna; se diferencia de sus congéneres en que el fruto no presente espinas. En esta especie ellas son reemplazadas por la prolongación de los dientes del cáliz." Knuth (1927) cites Otto 983 & 1041 from Bolívar and Humboldt & Bonpland s.n. from Bermudez, Venezuela.

Aublet (1775) calls it "la tamone de la Guiane" and says "Cette plante vient dans l'île de Caÿenne, sur le bord des sentiers & des chemins. Elle croît plus abondamment sur le route de Loyola, allant à l'habitation de Madame Dubilly. Je l'ai aussi observée en différents endroits de la Guiane dans les liene découverts." He notes that in this species the two lower (shorter) stamens are sterile, having their anthers aborted.

Material of *Ghinia spicata* has been misidentified and distributed in some herbaria, including material distributed by Mains, as *G. curassavica* (L.) Oken and has even been so reported by Standley (1924) from Belize. The latter species is easily distinguished by its sharply spinose fruit and is actually not known from Belize. Reports of *G. spicata* occurring in the West Indies are also erroneous.

Blanchet 76, cited below, is a mixture with no. 3397 (*Ghinia juncea*) on at least one sheet in the Brussels herbarium.

Citations: BELIZE: Croat 23513 (Au), 24040 (W--2800455); Gentle 1181 (F--733720, I, Ld, Mi, N), 4134 (Ld, Mi, N), 6687 (Au--224747, Ld, Ld, Ld, Ld, Mi, Mi, N, S), 8482 (Au--224438, Ld, Mi, N, S), 9473 (Au--224368, Ld, S); Hunt 181 (W--2398662); Liesner & Dwyer

1429 (W--2800217); Mains 4118 (Mi); Peck 168 (G); Schipp 612 (Ca--426858, F--621916, G, Mi, N, S). GUATEMALA: Alta Verapaz: J. A. Steyermark 45247 (N). El Petén: Contreras 547 (Ld). NICARAGUA: Yelaya: Seymour & Robbins 5820 (N). VENEZUELA: Bolívar: Aristey-Uribe 5898 (N, W--2777288); Davidse, Ramia, & Montes 4633 (W--2788951); Ruiz-Teran & Lopez-Palacios 11496 (Ld), 11577 (Mi); J. A. Steyermark 57672 (F--1221910, N, Ve--26389), 89285 (N); Steyermark, Dunsterville, & Dunsterville 105448 (N); Tamayo 2683 (Ve, W--1907902). GUYANA: Herb. Forest. Dept. Br. Guian. B.409 (N, Wb). SURINAM: Focke 1029 (Ut); Leandrê 70 (Le); Lanjouw & Lindeman 1764 (N); Splitgerber 744 (Le); Wulfschlägel 784 (Br, Br, Br, Gt). FRENCH GUIANA: Aublet s.n. (S--isotype); Black & Klein 54-17397 (Z); W. B. Broadway 126 (N); Collector undetermined 355 (Cp); Herb. Harvey s.n. (Du--166395). BRAZIL: Bahia: Belem 3529 (Ld, N); Bierens de Haan 117 (Ut); Blanchet 76 (Br, Br, N); Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18491 (Ld, N); Harley, Renvoize, Erskine, Brighton, & Pinheiro in Harley 15881 (Ld), 17497 (Ac), 17560 (Ld); Martius 2183 (Mu--547), s.n. (Mu--598, Mu--599). Ceara: Löfgren 719 (S). Maranhão: Eiten & Eiten 4178 (N, W--2445208). Paraíba: Coêlho de Moraes 2068 (Mm). Pernambuco: Pickel 3637 (F--849823, I, Mi, N, N, N). CULTIVATED: Germany: Herb. Zuccarini s.n. [Hortus bot. Monac.] (Mu--600).

GHINIA SUBBIFLORA (Urb. & Ekm.) Mold., Revist. Sudam. Bot. 4: 17. 1937.

Synonymy: *Tamonea subbiflora* Urb. & Ekm., Arkiv Bot. Stockh. 22 A (10): 106. 1929.

Bibliography: Urb. & Ekm., Arkiv. Bot. Stockh. 22A (10): 106. 1929; A. W. Hill, Ind. Kew. Suppl. 8: 233. 1933; Mold., Revist. Sudam. Bot. 4: 17. 1937; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 401. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 25, 26, & 93. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 99. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 44, 48, & 186. 1949; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 283. 1957; Mold., Résumé 52, 56, 57, & 456. 1959; Angely, Liv. Gen. Bot. Bras. 35 & 45. 1960; Gibson, Fieldiana Bot. 24 (9): 230. 1970; Mold., Fifth Summ. 1: 96, 102, & 104 (1971) and 2: 879. 1971; Alain in León & Alain, Fl. Cuba, ed. 2, 2: 283. 1974; Mold., Phytol. Mem. 2: 89, 95, 96, & 548. 1980; Mold., Phytologia 47: 416. 1981.

An annual or perennial plant, 20--60 cm. tall; main root to 10 cm long, slenderly branched; stems many, erect or ascending, the lower ones thickened or even subligneous, to 4 mm. thick; upper branches minutely pilosulous; petioles filiform, 2--9 mm. long, minutely spreading-pilosulous; l-af-blades membranous, ovate to oblong, 0.6--2.5 cm. long, 3--12 mm. wide, apically obtuse, basally subtruncate and slightly protracted into the petiole, marginally completely dentate-serrate, minutely pilosulous above and also beneath especially on the venation; secondary veins 5 or 6 per side, the lowest originating at the base of the blade, hardly prominent above, green above, paler beneath; inflorescence axillary, 1- or 2-flowered; peduncles 3--10 mm. long, very shortly

spreading-pilose; bracts filiform, 1--1.5 mm. long; lateral pedicels scarcely 1 mm. long, pseudoterminal one above the bracteoles only 0.5--1 mm. long; calyx 3 mm. long, its tube obconic, membranous, rather thickly 5-veined, the veins minutely scabridous and excurrent in linear teeth about 1 mm. long; corolla pale-lilac, about 4.5 mm. long, its tube basally cylindric, apically to about twice as wide, very shortly pilose within at the stamen insertion, the lobes unequal, more or less semiorbicular, the anterior ones subtruncate and longer, half the length of the tube; stamens didynamous, included, the longer pair inserted at the middle of the corolla-tube, the shorter ones at 1/3 its height; longer filaments during anthesis apically dilated into an ovate densely glanduliferous appendage, the shorter one unappendaged; style about 8 mm. long; stigma oblong, oblique; fruit turbinate, the body 3--4.5 mm. long, subapically 4-horned, the horns conspicuously unequal, two 4--5 mm. long, the other two 2--3 mm. long.

The species is based on *Ekman H.8844* from Quaternary calcareous soil along roadsides near La Source on the island of Gonave, Haiti, where it is described as rare, deposited in the Stockholm herbarium. Urban & Ekman (1929) cite also *Ekman H.4500* & *H.8850* from Hairi. They comment that "omnes aliae hujus generis species floribus in spicas pluri- vel multifloras dispositis gaudent; *T[amonea] scabra* Cham. et Schlecht. foliis similis praeterea calyce paullo majore et cornubus fructuum brevioribus recedit."

Collectors have found the species growing in wet places along roadsides, at 400 m. altitude, flowering and fruiting in July and August. Material has been misidentified and distributed in some herbaria as *Tamonea curassavica* (L.) Pers.

Citations: CUBA: Oriente: *Hioram 1777* (N). HISPANIOLA: Haiti: *Ekman H.4500* (Ca--608088, F--839465, Ld, Ld, Mi, S, W--1410030). HISPANIOLAN OFFSHORE ISLANDS: Gonave: *Ekman H.8844* (F--photo of type, Ha--photo of type, N--isotype, N--photo of type, Pi--photo of type, S--type, S--isotype, Si--photo of type, Z--photo of type).

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NOTES ON THE GENUS *HOSEANTHUS* (VERBENACEAE)

Harold N. Moldenke

Lack of time this late in life prevents my preparation of the complete and detailed monograph of this genus as originally planned and announced, but it has seemed advisable to place on record the bibliographic and herbarium notes on the genus accumulated by my wife and myself over the past 52 years. Explanation of the herbarium acronyms employed are fully explained in *Phytologia Memoirs* 2: 463--469 (1980) and are the same as used throughout this series of papers since 1933.

HOSEANTHUS Merr., Journ. Straits Br. Roy. Asiat. Soc. 76: 114. 1917.

Synonymy: *Hosea* Ridl., Journ. Straits Br. Roy. Asiat. Soc. 50: 124--125. 1908 [not *Hosea* Dennst., 1818].

Bibliography: Dennst., Schlüss. Hort. Malab. 31. 1818; C. B. Clarke in Hook. f., Fl. Brit. India 4: 590. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 561 & 1175. 1893; Gamble in King & Gamble, Journ. Asiat. Soc. Beng. 74 (2) [extra no.]: 841. 1908; Ridl., Journ. Straits Br. Roy. Asiat. Soc. 50: 124--126. 1908; Henkel, Gard. Chron., ser. 3, 48: 211 & 212, fig. 83. 1910; Prain, Ind. Kew. Suppl. 4, imp. 1, 124. 1913; E. D. Merr., Journ. Straits Br. Roy. Asiat. Soc. 76: 114. 1917; Ridl., Bull. Jard. Bot. Buitenz., ser. 3, 17: 459. 1918; Ridl., Journ. Straits Br. Roy. Asiat. Soc. 79: [17]. 1918; H. J. Lam, Verbenac. Malay. Arch. 8, 236--238, 364, & 366. 1919; H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 3, 72--73, 95, 109, & 112. 1921; E. D. Merr., Enum. Born. Pl. 517--518. 1921; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 245. 1927; Fedde, Justs Bot. Jahresber. 47 (2): 300 & 334. 1929; Stapf, Ind. Lond. 3: 442. 1930; Wangerin, Justs Bot. Jahresber. 50 (1): 237. 1930; Junell, Symb. Bot. Upsal. 1 (4): 110, 111, & 203, fig. 174. 1934; Mold., Suppl. List Inv. Names 3. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 65 & 93. 1942; Mold., Alph. List Inv. Names 18 & 58. 1942; Mold., Phytologia 2: 104. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 561 & 1175. 1946; Mold., Alph. List Inv. Names Suppl. 1: 6 & 11. 1947; H. N. & A. L. Mold., Pl. Life 2: 34 & 65. 1948; Van Steenis, Bull. Bot. Gard. Buitenz., ser. 3, 17: 459. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 145 & 186. 1949; Mold., Résumé 192, 266, 299, 411, 417, & 457. 1951; Angely, Cat. Estat. Gen. Bot. Fan. 17: 4. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14357. 1958; Prain, Ind. Kew. Suppl. 4, imp. 2, 124. 1958; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 561 & 1175. 1960; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 174. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 557. 1966; Rouleau, Guide Ind. Kew. 94 & 352. 1970; Mold., Fifth Summ. 1: 325 & 449 (1971) and 2: 528, 760, 770, & 881. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 570. 1973; Mold., Phytologia 26: 368 & 505. 1973; Gibbs, Chemotax. Flow. Pl. 3: 1753 & 1754. 1974; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41 & 47. 1978; Mold., Phytol. Mem. 2: 315, 354, & 550. 1980.

Climbing shrubs; leaves decussate-opposite, simple, petiolate, exstipulate, the upper ones on each branchlet reddened; inflorescence cymose, axillary in the axils of the upper leaves, the cymes long-pedunculate, spreading, dichotomously branched; calyx gamosepalous, inferior, campanulate-spathaceous, zygomorphic, bilobed, the lobes ovate; corolla gamopetalous, zygomorphic, hypocrateriform, bilabiate, the tube slender, elongate, the limb 4-lobed, 3 lobes obovate, the other lobe linear-oblong; stamens 4, inserted in the corolla-tube, long-exserted; filaments filiform; anthers rounded; pistil single, compound, bicarpellary; style as long as the stamens; stigma lanceolate; ovary superior, distinctly 4-lobed, 4-celled, each cell 1-ovulate; fruit drupaceous, fusi-

form, narrowed at both ends, apically acuminate; pericarp leathery, deep-purple; seeds elongate, solitary.

Type species: *Clerodendron lobbii* C. B. Clarke [= *Hoseanthus lobbii* (C. B. Clarke) Merr.]

This is a monotypic genus, as far as now known, probably related to *Faradaya* F. Muell., from which, according to Lam (1919) its large fusiform fruits distinguish it. Junell (1934), on the basis of a Ridley specimen at Kew from the Singapore Botanical Garden, says: "Diese Gattung scheint hinsichtlich des Gynaceumbaus eine Zwischenstellung zwischen *Oxera* und *Clerodendron* einzunehmen. Der Fruchtknoten ist deutlich lobiert, und die Stellung der Samenanlagen ist dieselbe wie bei *Oxera*. Die Fruchtblattränder sind jedoch nicht so stark eingerollt, und die Plazenten sind tief gespalten. Die Frucht zerfällt bei der Reife. Bei *Clerodendron* und nahestehenden Gattungen zerfällt sie gewöhnlich in vier mehr oder weniger fleischige Steine. Bisweilen abortiert eine oder mehrere Samenanlagen. Bei *Faradaya* und *Hosea* ist die grosse Frucht oft so tief geteilt, dass sie beinahe aus getrennten Teilfruchten besteht. In der Regel scheint ein Teil der Samenanlagen zu abortieren, und bei *Hosea* scheint die Frucht immer einsamig zu sein und besitzt lederartiges Perikarp. In diesem Teil von *Clerodendreae* scheint die Entwicklung auf die Ausbildung von Typen mit einsamigen, trockenen, grossen Früchten abzuzielen." He asserts, furthermore, that in *Hoseanthus*, as in *Holmskioldia*, *Oxera*, and *Faradaya* "sind die Samenanlagen mit ihrem chalazen Teil an der Plazenta befestigt".

Ridley was the first to recognize this genus and (1918) in arguing for the retention of the name, *Hosea*, which he proposed for it, says: "In Journal No. 76, p. 114, Mr. Merrill gives as a New Genus *Hoseanthus* for my genus *Hosea* (*Verbenaceae*) on the ground that Dennstedt had previously published a genus *Hosea*. This is quite unnecessary additional synonym. Dennstedt got hold of a copy of Rheede's *Hortus Malabaricus* a work in several volumes of rather poor drawings of South Indian plants, and published a *Schlüssel zum Hortus Indicus Malabaricus* in 1818. In cases where the drawing was so poor as to be not identifiable he gave it a new generic and specific name, but as no description whatever was published by him or even any suggestion as to the order of the plant these names rank as nomina nuda and are valueless. One of these plants was apparently a shrub which was so ill done that it is impossible to certainly identify it and to this sketch Dennstedt gave the name in his list of *Hosea*. Whatever the picture was intended to represent, it has doubtless long ere this received a properly accredited name and description, but I cannot find that any one has ever identified it and I do not know what it is meant for. Where the drawings in this work have been later identified Dennstedt's name has sometimes been retained, though as he did not ever describe one of them, the names were mere nomina nuda and might have been dropped. This being the case it is quite unnecessary to add to the ever increasing synonyms by substituting *Hoseanthus* for *Hosea* to retain the latter name for a plant which no one has ever identified and probably never will identify, and

which the author Dennstedt never saw in his life nor I expect, would have recognized if he did see it. Dennstedt was evidently not so much a botanist as a compiler of lists; after publishing a Flora of Weimar in Germany he published about 4 compilations of lists of cultivated plants and the above mentioned Schluessel, and nothing else. One cannot protest too strongly against the unnecessary increase of synonyms for plants. Scientifically it has no value at all and only adds to confusion, and bulk of literature for no useful purpose."

Needless to say, Merrill rejects this argument and actually identified Dennstedt's plant as probably a species of *Symplocos* (*Symplocaceae*). Hitherto I have accepted Ridley's argument and have retained *Hosea* as the accepted name for the genus, but it now appears that a strict interpretation of the present edition of the Code holds that no matter if a description is inadequate or an illustration poor, a later homonym must be rejected unless it is formally conserved. Ridley's name has not up to now been conserved. Airy Shaw (1973) definitely accepts *Hoseanthus* as the valid name and in this I now follow him.

The genus is named in honor of George Frederick Hose (1838--1922), and English missionary who collected extensively in Malaya and the Straits Settlements.

Excluded species:

Hosea malabarica Dennst., Schlüss. Hort. Malab. 31. 1818 =
Symplocos sp., *Symplocaceae*.

HOSEANTHUS LOBBII (C. B. Clarke) Merr., Journ. Straits Br. Roy. Asiat. Soc. 76: 114. 1917.

Synonymy: *Clerodendron lobbii* C. B. Clarke in Hook. f., Fl. Brit. India 4: 590. 1885. *Hosea lobbiana* (C. B. Clarke) Ridl., Journ. Straits Br. Roy. Asiat. Soc. 50: 125. 1908. *Clerodendron lobbiana* Clarke apud Ridl., Journ. Straits Br. Roy. Asiat. Soc. 50: 125, in syn. 1908. *Hosea lobbiana* Ridl. ex Prain, Ind. Kew. Suppl. 4, imp. 1, 124. 1913. *Clerodendron lobbianum* [C. B. Clarke] ex Prain, Ind. Kew. Suppl. 4, imp. 1, 125, in syn. 1913. *Hosea lobbii* Ridl. ex E. D. Merr., Journ. Straits Br. Roy. Asiat. Soc. 76: 114, in syn. 1917; H. J. Lam, Verbenac. Malay. Arch. 227. 1919. *Hoseanthus lobbii* Merr., Enum. Born. Pl. 517, in syn. 1921. *Clerodendron lobbianum* Ridl. ex H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 95, in syn. 1921. *Hosea lobiana* Ridl. ex H. J. Lam in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 95, in syn. 1921. *Clerodendron lobbianum* C. B. Clarke ex Mold., Alph. List Inv. Names 18, in syn. 1942. *Hoseanthus lobbii* (Ridl.) Merr. ex Mold., Résumé 299, in syn. 1959.

Bibliography: See bibliography of the genus as a whole.

Illustrations: Henkel, Gard. Chron., ser. 3, 48: 211, fig.

83. 1910; Junell, Symb. Bot. Upsal. 1 (4): 110, fig. 174. 1934.

A tall, slender, woody climber; branchlets minutely pubescent; petioles 0.6--2.5 cm. long; leaf-blades elliptic-ovate or ovate-rotund, 5--7.5 cm. long, 4--6 cm. wide, apically obtuse or broadly cuneate, marginally entire, basally rounded or subcordate,

shiny and glabrous above, minutely pubescent beneath, the upper ones on the branchlets reddened; cymes axillary. numerous, long-pedunculate, dichotomous, 12--20-flowered, minutely gray-pubescent; bracts linear, about 3 mm. long; peduncles 7.5--10 cm. long; pedicels 2--12 mm. long; calyx yellow-green, campanulate, obovate, about 1.2 cm. long, deeply bilobed, externally minutely gray-pubescent and with scattered round glands, the lobes ovate-deltoid, 5--6 mm. long, 2-toothed, valvate in bud, the teeth 2.5--3 mm. long; corolla-tube whitish, slender, narrowly infundibular, 0.5--2.5 cm. long, glabrate, the limb 4-lobed, salmon-red or orange in color, deeply bilabiate, the upper lip entire and linear-oblong, about 7 mm. long and 4 mm. wide, the lower lip 3-lobed and about 6 mm. long, the lobes rounded and 2 mm. wide, the whole limb about 1.2 cm. long and 1 cm. wide; stamens 4, inserted near the base of the corolla-tube, the filaments filiform, 2.6--5 cm. long, crimson, exserted; pollen orange in color; style filiform, about 2.8 cm. long, equaling the stamens; stigma very small, green, lanceolate; ovary glabrous, 4-lobed, the lobes elevated and rounded; fruits 1 or 2, deep-purple, fusiform or horn-shape, elongate, to 7.5 cm. long and 1.2 cm. wide at the mid-point.

The species is based on an unnumbered Lobb collection supposed by Clarke (1885) to have come from Penang, but Ridley (1908) feels certain that Lobb's collection was not made in Penang, but at Kuching, Borneo, where the species is very common. In this Merrill (1917) agrees. Gamble (1908) says that "It is a very handsome, striking plant, and has been cultivated [in Singapore]. It has the upper leaves of the spray bright red, flowers of a light salmon red, and a horn-shaped fruit about 2 in. long. There is a good picture of it in Miss North's Gallery at Kew, to which Mr. Ridley has drawn our attention."

Lam (1921) cites "Borneo: G. D. H. [Haviland - note of the author] (Smiles) p. 359, Sarawak. Distribution: W.-Borneo (also Penang?)." In his 1919 work he has a similar statement: "Distribution: Borneo (Sarawak nr. Kuching) (also Penang?)."

The only vernacular name recorded for the plant is "d'dap mira". Gibbs (1974) reports that syringin is absent from the stems and the reaction to the HCl/methanol test was negative. A pollen sample was taken from *Sinclair & Tassin 10411* by M. Strick in January 1972.

Merrill (1917) cites *Foxworthy 88*, *Hose 135*, and *Native Collector 280 & 739* from Sarawak. He comments that "The species was originally described from Penang, localized from a specimen collected by Lobb. There is not the slightest doubt but that Lobb's specimen was from Sarawak, not from Penang. I have here proposed the new generic name *Hoseanthus* for this endemic monotypic Bornean genus as the generic name proposed by Ridley is manifestly invalidated by *Hosea* Dennst."

It is perhaps worth noting here that the index on p. 334 of Just's Bot. Jahresber., vol. 47 (2), refers this species to p. "45" instead of to p. 245.

Recent collectors describe the plant as a large tall shrub

or climber, the leaves dark-green and glossy above, paler and slightly glossy beneath, the young ones orange in color, the bracts bright-orange or orange-pink, the stamens light-red or purple, the "flowers" [corollas?] bright-orange (*Brooke 8331*), "beautiful bright-orange" (*Brooke 8697*), or "orange" (*Kiah S.135*) to "salmon color" (*Foxworthy 88*) or "yellow and red inside" (*Native Collector 5268*), and the fruit as brownish-red. They have found the plant "common all along the riverbanks", "growing over bushes at the edge of tidal swamps", "in and beside water in forests", and "beside wet ditches at edge of forests", flowering in April, June, and August, and fruiting in August.

Citations: GREATER SUNDA ISLANDS: Sarawak: *Brooke 8331* (W--2319627), *8697* (W--2319683); *Foxworthy 881* (N--photo, Ph, Z--photo); *Haviland 359* (Bz--21387); *Native Collector 280* (Bz--21386, Ca--213896, Le--923213-139), *739* (Ph), *5268* (Ca--357426, N); *Sinclair & Tassim 10411* (N, N). CULTIVATED: Singapore: *Nur s.n.* [Herb. Singapore 35479] (Ba); *Sidek bin Kiah S.135* [Herb. Sing. Bot. Gard. Introd. 65] (Ba).

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NOTES ON THE GENUS *GARRETTIA* (VERBENACEAE)

Harold N. Moldenke

Lack of sufficient time at this late stage in life now prevents the preparation of the thorough monographic treatment of this genus originally planned and announced, yet it seems worthwhile to place on record the bibliographic and other notes assembled on the genus by my wife and myself in our work on the *Verbenaceae* of the world over the past 52 years. This is the 62nd genus so treated in the present series of papers. Full explanation of the herbarium acronyms herein employed will, as usual, be found in *Phytol. Mem.* 2: 463--469 (1980).

GARRETTIA Fletcher, *Kew Bull. Misc. Inf.* 1937: 71. 1937 [not *Garretia* Welw., 1858].

Bibliography: Welw., *Apont. Phytogeog. Angola* 587. 1858; Fletcher, *Kew Bull. Misc. Inf.* 1937: 71, 72, & 74, fig. 1 (1937) and 1938: 406, 409, & 437. 1938; Lam & Meeuse, *Blumea* 3: [248]--254, fig. 1. 1939; Meeuse, *Blumea* 5: 66--68. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 60 & 92. 1942; Hill & Salisb., *Ind. Kew. Suppl.* 10: 96 & 251. 1947; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 137, 144, 147, & 185. 1949; Mold., *Phytologia* 4: 79 (1952) and 4: 193--195. 1953; E. J. Salisb., *Ind. Kew. Suppl.* 11: 98 & 265. 1953; Angely, *Cat. Estat. Gen. Bot. Fan.* 17: 4. 1956; Anon., *U. S. Dept. Agr. Bot. Subj. Ind.* 15: 14362. 1959; Mold., *Résumé* 178, 189, 190, 196, 276, 382, 419, & 455. 1959; Backer & Bakh., *Fl. Java* 2: 595 & 612. 1965; F. A. Barkley, *List Ord. Fam. Anthoph.* 76 & 167. 1965; Airy Shaw in J. C. Willis,

Dict. Flow. Pl., ed. 7, 467. 1966; Mold., Fifth Summ. 1: 296, 324, & 473 (1971) and 2: 716, 758, 778, & 878. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 478. 1973; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 40, 47, & 51. 1978; Mold., Phytol. Mem. 2: 286, 315, & 588. 1980; Mold., Phytologia 47: 335. 1981.

Small erect shrubs; leaves decussate-opposite, 1--3-foliolate, herbaceous, entire or shallowly crenate-serrate; inflorescence cymose, the cymes dichotomous or trichotomous, axillary and solitary or rarely in pairs or else aggregate in a leafy terminal panicle, pedunculate, rather densely short-hairy, the branches slender, racemiform; bracts minute; pedicels short, persistent after the fruiting-calyx has fallen; flowers complete, perfect, hypogynous; calyx gamosepalous, campanulate, its rim very shortly 5-dentate (with very obtuse teeth) or entire, externally glanduliferous with sessile glands; corolla gamopetalous, zygomorphic, hypocrateriform, externally glanduliferous like the calyx, its short tube and limb subequal, the limb bilabiate, the superior (posterior) lip bifid, the inferior (anterior) lip trifid, with the median lobe largest; stamens 4, subequal or didynamous with 2 long and 2 short, all fertile, the longer ones exserted, the shorter ones included; anthers dorsifixed; pistil one, compound, bicarpellary; style single, filiform, terminal; stigma subbilobed or shortly bifid; ovary superior, compound, at first 2-celled, later 4-celled, the cells 1-ovulate; fruiting-calyx persistent, not much accrescent, cupular, ampliate; mature fruit a capsule-like schizocarp, globose, immersed in the enlarged fruiting-calyx, apically rather flat, glanduliferous, dehiscing by means of 4 valves and thus scattering the 4 hard, ribbed pyrenes or nutlets.

Type species: *Garrettia siamensis* Fletcher.

This, as far as is now known, is a monotypic genus endemic to Thailand and Indochina. It is named in honor of H. B. G. Garrett of the Thailand Forest Service, who collected the type material.

Fletcher (1937) says that the "Fruit characters clearly place this genus in the tribe *Caryopterideae*, which includes the genera *Peronema*, *Hymenopyramis*, *Glossocarya*, *Caryopteris* and a recently described genus from Annam, *Karomia*, all of which are characterized by having a capsule which dehiscs by 4 valves into four 1-seeded pyrenes. The imparipinnate leaves and two stamens of *Peronema*, the greatly enlarged calyx surrounding the fruit of *Karomia*, the greatly accrescent 4-winged utricular calyx of *Hymenopyramis*, and the oblong exserted capsule of *Glossocarya* clearly forbid its inclusion in any of these genera. Undoubtedly its nearest affinity is with *Caryopteris* which differs in having a deeply 5-fid calyx, greatly exserted stamens, and the posterior lip of the corolla usually fimbriate or toothed."

Welwitsch's genus *Garretia* is a member of the *Meliaceae* and its scientific name is not strictly homonymous, differing by one letter.

GARRETTIA SIAMENSIS Fletcher, Kew Bull. Misc. Inf. 1937: 71, 72, & 74, fig. 1. 1937.

Synonymy: *Cymaria triphylla* Baker ex Lam & Meeuse, *Blumea* 3: [248], in syn. 1939. *Vitex cymarioides* Lam & Meeuse, *Blumea* 3: [248]--254, fig. 1. 1939. *Garrettia cymarioides* (Lam & Meeuse) Meeuse, *Blumea* 5: 67--68. 1942.

Bibliography: See that of the genus as a whole.

Illustrations: Fletcher, *Kew Bull. Misc. Inf.* 1937: 72, fig. 1. 1937; Lam & Meeuse, *Blumea* 3: 250, fig. 1. 1939.

A small erect shrub or undershrub, 0.2--2 m. tall; branches terete or somewhat tetragonal, the lower ascending, the upper erect, basally 4--6 mm. thick, conspicuously and very shortly brown-puberulent or pulverulent, the older parts corky, the young parts always distinctly tetragonal; bark coarse, brown to yellowish-brown or light-gray, with few lenticels; leaves decussate-opposite, the lower ones always 3-foliolate, those toward the tip of the branchlets 2-foliolate, bifid, or 1-foliolate; petioles very slender, brown, 1.7--5 cm. long, terete or somewhat canaliculate above, pulverulent or puberulent; leaf-blades membranous or herbaceous, ovate or ovate-oblong to lanceolate-ovate, brunnescenscent (in drying) above, paler and often grayish-brown beneath when dry, 3--10 cm. long, 0.5--5 cm. wide, apically attenuate to the acute or acuminate tip, rarely emarginate or bifid (the acumen itself acute or blunt to obtuse), marginally entire or more or less irregularly crenate-serrate and sparsely ciliolate, basally sometimes rounded or obtuse to broadly acute and abruptly decurrent, sometimes subcordate, sometimes more or less asymmetric, subglabrous above except for the minutely pubescent and more or less reddish venation or appressed-puberulent and glandular-punctate on both surfaces especially beneath, the glands sessile, often red or white, the venation pubescent; midrib subprominent on both surfaces; secondaries 3--8 pairs, subprominent on both surfaces, ascending at an angle of 30--40°, parallel, arcuately joined into the leaf-margins; tertiaries reticulate, obscure; inflorescence cymose, dichasial, bifurcate, the axes minutely and densely pubescent, the 2 terminal ramifications monochasial, pseudoracemose, usually curvate; cymes spreading, dichotomous or sometimes trichotomous, more or less many- [10--25-] flowered, 1--6 cm. long, gradually smaller and closer together upwards, pulverulent or puberulent, lateral and solitary (rarely paired) or congested in a large terminal leafy panicle; peduncles slender, 0.5--1.5 cm. long; pedicels 0.5--1 mm. long, apically articulate, pulverulent, glanduliferous; bractlets minute, subulate, persistent, subopposite to the pedicels, about 0.5 mm. long, pulverulent and glanduliferous; calyx campanulate, green, brunnescenscent in drying, 1.5--1.7 mm. long, 1--1.3 mm. wide, 5-ribbed (the ribs terminating in the teeth, if any), externally basally sparsely puberulent and yellow-glanduliferous, internally glabrous, the rim very shortly and bluntly 5-dentate or subentire, subglabrous and non-glanduliferous; corolla yellowish, hypocrateriform, zygomorphic, indistinctly bilabiate, externally glabrous or sparsely puberulent, its tube 1.5--2 mm. long, usually slightly longer than the calyx, eglandular, internally sparsely pubescent at the stamen insertion, the limb bilabiate, yellow-glanduliferous, the posterior

(upper) lip 2-lobed, light-yellow, about 1 mm. long, consisting of 2 oblong-ovate lobes, the anterior (inferior) lip 3-lobed, about 2 mm. long and 2--2.5 mm. wide, the lobes unequal, the middle one larger, orbicular, about 1.7 mm. wide, white with a yellow base, the lateral ones smaller (but larger than those of the upper lip), ovate, about 1.2 mm. long, pale-yellow, the tube and the lobes externally pubescent and glanduliferous, the glands more crowded toward the tips of the lobes, internally glabrous except for a narrow strip of long white hairs in the throat at the base of the lower lip; stamens 4, inserted about 1.5 mm. above the base of the corolla-tube, subequal with subequal filaments and not at all or hardly exserted, or else plainly didynamous with the longer pair exserted; filaments subequal or else two about 1.5 mm. long and the other two 2 mm. long, light-yellow, densely pilose or villous and often covered with stalked glands on the lower half and base, glabrous and often covered with sessile glands on the upper half; anthers brown, ovoid, about 0.5 mm. long, smooth or minutely papillose, eventually basally divaricate, dehiscing by means of a large ovate slit; style filiform, 2--2.5 mm. long, somewhat gynobasic; stigmas 2, rounded; ovary globose or subglobose, about 0.75 mm. long and wide, glabrous or densely and completely covered with glands, 2-celled, each cell with 2 ovules inserted at the angles of the carpel-margins, which are curved inward and located in the upper part of the cell, descendant, apotropous; fruiting-calyx persistent, accrescent, membranous, semi-campanulate or semi-globose, 1.5--2 mm. long, 0.9--2.3 mm. wide, light-brown, subtruncate, closely enclosing the fruit, externally lightly pubescent, covered with numerous, small, sessile glands, the rim subtruncate, with 5 very minute teeth; fruit exserted from the fruiting-calyx, composed of 4 pyrenes, brown and very hard when dry.

This species is based on *Garrett 988* from Doi Chiengdao, north of Ban Tam, at about 420 m. altitude, in northern Thailand. The mountain on which the type was collected is the second highest in Thailand (to 2185 m.) and, according to Fletcher (1937) has over 30 endemic species on it.

Vitex cymarioides Lam & Meeuse is based on *Backer 28867* from Poeloe Sepandjang in the Kangean Archipelago, where it is said to be "frequent, often consociately growing in a heterogeneous forest in heavy black soil behind the tidal forest", at about 1 m. altitude, deposited in the Leiden herbarium. Lam & Meeuse also cite *Teijsmann 1750* from Madoera and *Karta 28* and *Teijsmann 1768* from Bawean. They comment that "*Vitex cymarioides* strikingly resembles *Cymaria acuminata* Decne. (*Labiatae* - *Ajgoideae*) from E. Java, Timor, Celebes, Mindanao and Luzon, particularly in its general habit (small shrub) and in the shape of the leaves and of the inflorescences, the extremely monochasial branches of which are quite unusual for the *Verbenaceae*. It therefore seems to be one of the most perfect links between the *Labiatae* and the *Verbenaceae* (in the orthodox delimitation of these families), thus far known. In his important study on these closely related orders, Junell.....stated.....that there is hardly a single

feature or a combination of features to be found, by which these two families can be separated, except perhaps on the basis of the placentation, with which differences in the morphology of the inflorescences seem to be correlated.

Cymaria triphylla Backer is based on *Teijsmann H.B.1750* from Madura island.

Garrettia siamensis has been encountered in mixed forests and evergreen forest jungles, at altitudes of 1--400 m., flowering and fruiting in April, May, and December. Phloenchit reports it as "a shrub not common in evergreen forests" in Thailand. Meeuse (1942) records it from Thailand, Kangean, Bawean, and Madura. In a letter to me, dated December 9, 1953, he comments that "The remarkable disjunct distribution (Siam, Islands near Java) is interesting, but has no counterpart as far as I know and cannot be explained."

The only recorded vernacular name for the plant is "rokoh-rokoh".

Citations: THAILAND: *Larsen & Larsen 33968* (Ac, Ld); *Phloenchit 434* [Herb. Roy. Forest Dept. 9087] (Z). GREATER SUNDA ISLANDS: Bawean: *Karta 28* (Bz--24034, Bz--24035, Le--938187-180, N); *Teijsmann 1768* (Bz--24036). Madura: *Teijsmann H.B.1750* (Bz--24037). Sepandjang: *Backer 28867* (Bz--24038, Bz--24039, Bz--24040, Le--923216-614, Le--938187-159, Le--938187-160, N, N--photo, Z--photo). Island undetermined: *Rappard 224* [Djervek-bani] (Bz--72915). MOUNTED ILLUSTRATIONS: Fletcher, Kew Bull. Misc. Inf. 1937: 72, fig. 1 (Z); Lam & Meeuse, *Blumea* 3: 250, fig. 1 (Z).

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BOOK REVIEWS

Alma L. Moldenke

"THE FLORA OF ALDABRA and Neighbouring Islands" by F. R. Fosberg & S. A. Renvoize, v & 358 pp., 55 b/w plates & 2 maps. Kew Bulletin Additional Series VII. Her Majesty's Stationery Office, P. O. Box 569, London SE1 9NH. 1980. 15 net. soft cover.

My review in *Phytologia* 46 (7): 500 of this well prepared work mentioned that my review copy ended with p. 326. The publishers immediately sent me a complete copy which includes the balance of the treatment on grasses, C. C. Townsend's treatment of the mosses and the index. This notation gives me the chance to spell correctly the name of the second author.

"PHYTOLOGIA MEMOIRS" published by Harold N. & Alma L. Moldenke,
303 Parkside Road, Plainfield, New Jersey 07060.

Since I am intricately involved with my husband in preparing this new periodical I am not in a position to review it but rather to point out that, as announced, it is planned to take longer botanical and phytoecological papers than would fit conveniently into single issues or volumes of "PHYTOLOGIA". Like the latter, it is photo-offset printed on short notice (to secure prompt publication) from camera-ready typescript with or without illustrations, but in the larger 8 1/2 x 11 inch size.

In addition to our Standing Orders, authors (1) note how many additional copies they would require for personal distribution/sale, (2) pay the estimated printing bill as a deposit with their typescript, (3) set the publication sale price, (4) receive their own copies for sale to future subscribers to the series, and (5) are refunded by us the payments received from the Standing Orders.

The first three PHYTOLOGIA MEMOIRS have already appeared: I "A Check List of the Vascular Plants of Nicaragua" by Frank C. Seymour, 314 pp. 1980. \$15 plus postage and handling. -- II "A Sixth Summary of the *Verbenaceae*, *Avicenniaceae*, *Stilbaceae*, *Chloanthaceae*, *Symphoremaceae*, *Nyctanthaceae*, and *Eriocaulaceae* of the World as to Valid Taxa, Geographic Distribution and Synonymy" by Harold N. Moldenke, 629 pp. 1980. \$25 plus postage and handling. -- III "Flora of Hispaniola I. (*Celastrales*, *Rhamnales*, *Malvales*, *Thymeleales*, *Violales*)" by Alain H. Liogier, 218 pp. 1981. \$13 plus postage and handling.

"FLORA OF BAJA CALIFORNIA" by Ira L. Wiggins, x & 1025 pp., 969
b/w multiple line draw., 5 tab. & 4 maps. Stanford University Press, Stanford, California 94305. 1980. \$65.00.

This excellently prepared flora of the vascular plants of Baja California was started with the author's field collections of 1929 in this ecologically varied 1,300 km.-long narrow peninsula of mostly Sonoran desert with its isolated (until the recent appearance of the paved automobile road) different habitats on the mountains, in their canyons, and on the islands off both coasts. This synoptically treated flora includes 884 genera (each with at least one clear-cut illustration), 2,705 species, and 253 subspecies and/or varieties. From my desk the keys seem to work well, the introduction is elucidating, and my long existing admiration for Wiggins' life work is enhanced by perusal of this monumental work. How nice it would be if our family could make a return trip to Baja armed with this publication!

"HORTUS BENGALENSIS, or a Catalogue of the Plants Growing in the Honourable East India Company's Botanic Garden at Calcutta", by W. Roxburgh, v, xii & 105 pp. Reprint Edition by Boerhaave Press, P. O. Box 1051, 2302 BB Leiden, Netherlands. 1980. Dutch florins 75. Paperbound.

This recording of so many hundreds of generic and specific names first came from the Mission Press, Serampore, in 1814. They are listed in seven columns across the page under the following topics: Scientific names, Synonyms & Remarks, Native place, Donors & time, Duration & habit, Time of flowering, Time of seed. The introduction emphasizes the values - botanical, horticultural, medicinal, economic and cultural - of such native and plant introduction gardens. Appended is "A Catalogue of Plants Described by Dr. Roxburgh in his MSS. FLORA INDICA but not yet introduced into the Botanic Garden". Unfortunately, there are four blank pages and four doubly, and thereby obliterated and useless, printed pages in this section. It is certainly convenient to have the few remaining original copies of Roxburgh's work augmented by this fine reprinting.

"BRITISH NATURAL HISTORY BOOKS 1495--1900 A Handlist" edited by R. B. Freeman, 437 pp. Anchor Books, The Shoe String Press, Inc., P. O. Box 4327, Hamden, Connecticut 06514. 1980. \$39.50.

Contained are "firstly, all books about the fauna and flora of the British Islands, including all Ireland, the Channel Islands, and, oddly, but correctly, Heligoland. Secondly, all general natural history books written by inhabitants of these islands, and thirdly, translations into English of relevant books by foreign authors and a few American books which have appeared in English editions" to a total of 4,206. After the introduction there is an 8-page list of bibliographic references that are a treasure source in themselves. The alphabetical author list (with details as above) follows and is numbered. Then comes the list of titles from 1495--1800 and the subject index. How helpful this bibliographic source book will be to many students hunting older literature without complete titles, correct date, etc.!

"CONCISE ENCYCLOPEDIA OF THE SCIENCES" edited by John-David Yule, viii & 590 pp., 500 color photos & diagrams. Facts on File, Inc., New York, N. Y. 10019. 1980. \$29.95.

For a middle school, junior high school, home, or technical office library this compact collection of direct and reasonable explanations of the 6,000 plus scientific terms and 1,000 plus biographical entries important in all the modern sciences and technologies this book should be helpful. Considerable cross-referencing - indicated by a different printing style of the words - makes for additional efficient use. The 100 plus color illustrations, 400 plus diagrams and 50 plus tables are eye-catching and helpful. Folks who read this PHYTOLOGIA, however, will probably choose more advanced studies for themselves.

"ORCHIDS OF PANAMA" A Facsimile Reprint of the *Orchidaceae*, 'Flora of Panama' by Louis O. Williams & Paul H. Allen with "A Checklist of the Orchids of Panama as Known Today" by Robert L. Dressler, viii, 483 & xxvi pp., 231 b/w plates & fig. Missouri Botanical Garden, P. O. Box 299, St. Louis, Missouri 63166. 1980. \$28.95 paperbound.

W. G. D'Arcy's preface shows how these four fascicles (2--5) of the Flora of Panama, Part III, have been printed in two numbers of Volume 33 (1946) by L. O. Williams and in two numbers of Volume 36 (1949) by P. A. Allen of the ANNALS OF THE MISSOURI BOTANICAL GARDEN. The Stechert-Hafner replication of this material in 1965 is no longer available. Therefore welcome to this well done "Orchids of Panama" which has the added advantage of Dressler's 300 additions and updated nomenclature.

"SCIENTISTS & INVENTORS" by Anthony Feldman & Peter Ford, 336 pp., more than 400 color & 100 b/w photo & fig. Facts on File, Inc., New York, N. Y. 10019. 1979. \$17.50.

For young students or adults with scientific bent, for those who enjoy biographical sketches and wonder about the people behind the great discoveries and inventions this book is very interestingly, attractively and reliably presented. "It tells the stories of over 150 inventors and scientists from Empedocles to Christiaan Bernard, from Galileo to Einstein, from Gutenberg to Pasteur, from the Wright brothers to the Curie family.....Set out in chronological order, the result is a fascinating account of human progress.....into the technological age of today."

"THE ILLUSTRATED FLORA OF ILLINOIS -- FLOWERING PLANTS -- Magnolias to Pitcher Plants" by Robert H. Mohlenbrock, xii & 261 pp., 114 b/w line drawing plates & fig, 110 dotted county geographic distribution maps. Southern Illinois University Press, P. O. Box 3697, Carbondale, Illinois 62901.

This is the ninth volume in this continuing series very nicely treating 15 families with their 52 genera, 110 species and 13 lesser taxa. This study maintains the same format and high quality featured in all previous volumes by this apparently indefatigable botanist.

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CHROMOSOMES OF *SACHSIA*
(COMPOSITAE - INULEAE)

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The genus *Sachsia* has traditionally been placed in the tribe Inuleae, subtribe *Plucheinae* which is characterized as having two marginal stigmatic rows and bacular thickenings in the bases of the pollen grain spines. However, *Sachsia* and *Rhodogeron* which have sexine bacules branching toward the base, and *Stenachaenium* which has bacules anastomosing toward the base and submarginal stigmatic rows, are considered to be "several deviating genera whose inclusion in the group does not seem justified" by Merxmüller et. al. (1977) who exclude them from the *Plucheinae*. They conclude that when *Pterocaulon* and *Sphaeranthus* are also excluded from the *Plucheinae*, the subtribe becomes so coherent that generic distinction becomes the major problem.

The disposition of the excluded genera is unclear, therefore, the late William T. Gillis provided me with achenes of *Sachsia polycephala* Griseb. hoping that the chromosome number would be useful in clarifying the taxonomic position of the genus. It is hoped that this information will be useful toward that end.

METHODS. Achenes of *Sachsia polycephala* Griseb. from Dade Co. Florida, G. N. Avery 1672, 24 January, 1976 were germinated and the plants were grown to maturity in a growth chamber. Heads were collected in Carnoy's fixative (6 absolute ethanol : 3 glacial acetic acid : 1 chloroform). PMC's were squashed in acetocarmine and examined using phase illumination.

OBSERVATIONS. In all countable cells $n = 10$ (Figure 1) and meiosis appeared regular. This is the first chromosome report for *Sachsia*.



Figure 1. Meiotic chromosomes of *Sachsia polycephala* Griseb. x ca. 800

This count is consistent with chromosome counts for other genera in the *Plucheinae sens. lat.* except for *Blumea*. In *Blumea*, five different meiotic counts are reported among 23 counts from twelve

species; and twelve different mitotic counts are reported among 29 counts from 18 species. Apomixis apparently provides additional confusion in that genus.

Six counts in *Laggera* are all $n = 10$ and/or $2n = 20$. The same numbers are reported for one count in *Tessaria*, 18 of 19 counts reported for *Pluchea* (Banerjee and Sharma, 1974 report $2n = 30$ in *P. indica* (L)Less.), one count in *Pterigeron*, three in *Pterocaulon*, and four in *Sphaeranthus*.

Except for *Blumea*, chromosomally this group is cohesive and this count for *Sachsia* does not provide evidence for its exclusion from the Plucheinae as traditionally described.

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- Banerjee, A. K. and A. Sharma. 1974. Chromosome studies on some Indian members of Compositae. I. Tribe Inuloideae. Broteria Serie Trimestral Ciencias Naturais 43: 15-32.
- Merxmüller, H., et. al. 1977. Inulae - Systematic review, p. 577-602 in V. H. Heywood, J. B. Harborne, and B. L. Turner (eds.) The biology and chemistry of the Compositae, Vol.1 Academic Press, New York.

NOTE: A list of 97 chromosome counts from 41 species of six genera of Plucheinae and a 44 item bibliography citing the sources of those counts is available from this author.

STUDIES OF AMERICAN PLANTS -- XX

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HAMAMELIDACEAE

MATUDAEA TRINERVIA Lundell, Lloydia 3: 209--210. 1940;
Wrightia 6: 59. 1979.

El Salvador: Dept. Santa Ana, Montecristo, primary cloud forest, elev. 2000 m., Feb. 2, 1978, R. Martinez (M. L. Reyna 1141, LL), tree with bright pink flowers, "ujushte"; Montecristo, primary cloud forest, elev. 1950 m., Oct. 24, 1979, Reyna 1217 (LL), tree with red flowers, "ujushte".

These are the first records for the genus in El Salvador. It ranges south from Mexico into Guatemala, Honduras and Nicaragua.

The genus Matudaea Lundell, with two species M. trinervia and M. hirsuta Lundell, described from Mexico, and a fossil species, M. Menzelii Walther, found in the Middle Oligocene of Central Europe, are treated in a recent publication by H. Walther (Flora 170: 198--516. 1980).

CELASTRACEAE

EUONYMUS HABERI Lundell, sp. nov. -- Arbor, omnino glabra; folia parva, glabra, petiolata, petiolo ad 7 mm. longo, canaliculato; lamina subchartacea, elliptica vel rotundata, 3--6 cm. longa, 2--3 cm. lata, apice acuta, basi rotundata, integra, subtus paullo pallidior, nervis inconspicuis; flores 4-meri, cymosi, cymis axillaribus, ad 1.5 cm. longis, breviter vel longiuscule pedunculatis, 4--7-floris, pedicellis gracilibus usque ad 4 mm. longis; calyx ca. 2 mm. latus, lobis late ovatis, ad 1.2 mm. latis; petala rotundata, ad 4 mm. longa, 3 mm. lata, basi coalita, apice cucullata; stamina ca. 4 mm. longa; antherae ellipticae, apice emarginatae; ovarium glabrum.

Costa Rica: Prov. Puntarenas, Monteverde, lower community, elev. 1300 m., April 16, 1979, W. Haber 313 (LL, holotype), medium tree.

The small elliptic or rarely orbicular leaves rounded at base and with margin entire set the species apart from E. costaricensis Standl. The latter has much larger crenate-serrulate leaves, as well as petals described as only 2 mm. long.

E. Rothschuhii Loes., described from Nicaragua, is unknown to me.

QUETZALIA OCCIDENTALIS (Loes.) Lundell, Wrightia 4: 138.

1970. Microtropis occidentalis Loes., Bot. Gaz. 24: 393. 1897.

Panama: Prov. Panama, Cerro Jefe, cloud forest, premontane Rain Forest, elev. ca. 1000 m., June 11, 1975, S. Mori 6533 (LL), small tree, 4 m. tall, fruit brown, splits longitudinally into two halves.

The collection is the first I have seen from Panama. The species has been collected at various places in the mountains of Costa Rica, and this extension of its range was to be expected.

QUETZALIA REYNAE Lundell, sp. nov. -- Arbor, ramulis glabris, angulatis, crassiusculis; folia opposita, glabra, petiolata, petiolo 7--11 mm. longo, canaliculato; lamina chartacea vel subcoriacea, glabra, elliptica vel anguste elliptica, 5.5--10 cm. longa, 2.8--5 cm. lata, apice obtusa vel obtusiuscula, basi acuta; cymae 2--2.5 cm. longae, glabrae; pedunculi ad 1 cm. longi, 1--3-dichotomi; capsula anguste ellipsoidea, ad 2 cm. longa, acuta.

El Salvador: Dept. Santa Ana, Metapan, Montecristo National Park, in primary cloud forest, elev. 2000 m., Nov. 1, 1977, S. Martínez (M. L. Reyna 1114, LL, holotype), tree, "pata de palomo"; Montecristo, primary cloud forest, elev. 2200 m., Oct. 25, 1979, Reyna 1219 (LL), tree, "pata de palomo".

Q. Reynae is related to A. occidentalis (Loes.) Lundell and Q. ilicina (Standl. & Steyerl.) Lundell, differing from both in having much larger acute capsules up to 2 cm. long (immature). Its leaves, similar to those of Q. occidentalis, are obtuse rather than acute or subacuminate. Only flower buds are available and they are depressed-globose.

ZINOWIEWIA CUNEIFOLIA Lundell, sp. nov. -- Arbor, omnino glabra; folia opposita, parva, petiolata, petiolo 3--7 mm. longo, canaliculato; lamina subcoriacea vel chartacea, anguste elliptica vel lanceolata, 3--7.5 cm. longa, 1--3 cm. lata, revoluta, basi aequalia, anguste cuneata, apice obtusa, raro acuminata; cymae multiflorae, 3--5-dichotomae, ad 4 cm. longae; flores pedicellati, pedicelli 1--4 mm. longi; calyx quinquelobatus, lobis ovatis, obtusis, ca. 0.5 mm. longis, crassis; petala ovato-elliptica, 1.5--2 mm. longa, apice rotundata; stamina ca. 0.7 mm. longa; ovarium biloculare; fructus alatus.

El Salvador: Dept. Santa Ana, northern slopes of Santa Ana Volcan, 6000--7000 ft., Sept. 25, 1958, Paul H. Allen 6944 (LL, holotype), tree to about 80 ft., but often flowering when much smaller, flowers green, fruits with whitish wing, common throughout area, "culebro" or "naranjillo". Dept. Santa Ana, Parque del Hotel Co. Verde, elev. 1900 m., Sept. 1,

1976, E. A. Montalvo 4842 (MO, paratype; LL, fragment & xerox copy), árbol de pequeñas flores blancas perfumadar, frutas aladas.

Two other collections from the Department of Santa Ana, Reyna 1222 (LL), 1226 (LL), at Los Planes, near Montecristo in primary evergreen forest, are referable to Z. cuneifolia. In Reyna 1222, in flower, the pedicels are much shorter, the cymes are not as large, and the leaves are mostly acuminate. Reyna 1226 has mature fruits up to 1.7 cm. long with obovate rounded wing up to 6 mm. wide.

The revolute leaf margin of the small grayish subcoriaceous cuneate leaves, together with the obovate wing of the mature fruits are features of Z. cuneifolia to be noted.

Z. inaequifolia L. Wms., from Nicaragua, has leaves bilaterally unequal, much smaller cymes, and petals only 1--1.2 mm. long, as described by Williams. More collections of the Central American species are needed to work out relationships.

ZINOWIEWIA MICRANTHA Lundell, sp. nov. -- Arbor, ca. 5 m. alta, omnino glabra; folia opposita, aequalia, petiolata, petiolo 4--5 mm. longo, canaliculato; lamina subcoriacea, oblongo-elliptica vel ovata, 4.5--8 cm. longa, 2--3.5 cm. lata, apice acuta vel subacuminata, basi rotundata et acutiuscula, subtus pallida; cymae multiflorae, ad 3 cm. longae, 3--5-dichotomae, pedunculatae; pedicelli 1--2.5 mm. longi; flores 5-meri; calyx quinquelobatus, ca. 1.4 mm. diam.; petala oblongo-ovata, 1.2--1.4 mm. longa, apice rotundata; stamina ca. 0.5 mm. longa, recurvata; fructus alatus.

Panama: Chiriqui, Boquete Region, Cerro Horqueta, in cloud forest, 6500 ft., June 24, 1940, Christine and Wolfgang von Hagen 2130 (LL, holotype), tree, 15 ft. high, 6 in. trunk.

The minute flowers with calyx less than 1.5 mm. in diam. with the small lobes less than 0.5 mm. long, together with oblong-ovate petals up to 1.4 mm. long, probably are the smallest in the genus -- about the size of a pin head. The brownish subcoriaceous leaves are much paler beneath and have venation considerably coarser than that of Z. costaricensis Lundell and Z. australis Lundell, taxa of Panama and Venezuela. Known only from flowers and very immature samaras, the relationship of the species is doubtful.

TILIACEAE

MORTONIODENDRON PALACIOSII Miranda, Anal. Inst. Biol. Mex. 27: 323, fig. 1. 1957.

Guatemala: Dept. Peten, Lacandon, in bajo ca. 1.5 km. south, March 6, 1962, Elias Contreras 3474 (LL), tree, 6 in. diam., 40 ft. high.

El Salvador: Dept. Santa Ana, Metapan, near Montecristo, transitional vegetation between cloud forest and oak forest, elev. 2200 m., May 10, 1979, M. L. Reyna & R. Martinez 1202

(LL), tree about 15 m. tall with dark brown, rough bark, flowers apetalous with yellow sepals; Metapan, La Montanita, Parque Nac. Montecristo, dentro de Ecotono, cerca de bosque nebuloso, elev. 2200 m., Mar. 12, 1980, Reyna 1268 (LL), árbol de aprox. 15 m., con tronco levemente rugoso, semillas color café cubiertas de arilo carnosa rojo o anaranjado, "nispero", "nispero de montana".

Described by Miranda from Chiapas, these collections from Guatemala and El Salvador are the first records for Central America.

The species is unique in the genus in being apetalous and in having 1-seeded capsules.

MYRSINACEAE

ARDISIA ATROPURPUREA Lundell, sp. nov. -- Frutex; ramuli graciles, lepidoto-furfuracei; folia parva, supra et subtus lepidota, petiolata, petiolo 3--4 mm. longo; lamina membranacea, anguste elliptica, 4--7 cm. longa, 1.5--2.3 cm. lata, apice acuminata, acumine obtusiusculo, basi acuta; inflorescentia terminalis, tenuis, paniculata, pauciflora, ad 7 cm. longa et lata, lepidota; pedicelli graciles, 6--12 mm. longi; flores hermaphroditi, corymbosi; sepala 5, lepidoto-furfuracea, nigropunctata, ovato-elliptica, 1.5--1.8 mm. longa, eroso-ciliata, asymmetrica; petala 5, elliptica, ca. 3 mm. longa, basi coalita, atropurpurea, patentissima, extus lepidota, intus glabra, punctata, apice rotundata; stamina 5, ca 2 mm. longa; antherae lanceolatae, ca. 1.5 mm. longae, basi subsagittatae; filamenta ca. 0.5 mm. longa; ovula 6 vel 7.

Panama: Prov. Panama, from Torti to the Pilota del Toro, the mountain overlooking Torti Arriba, alt. 400--700 m., Aug. 27, 1977, J. P. Folsom, Gregario Alonzo de Monte 4998 (LL, holotype; MO, isotype), shrub of 4 m., 5 pale to deeper purple petal lobes with some darker streaking, stamens yellow.

A. atropurpurea is a taxon paired with A. pirreana Lundell, both distinguished at once by the unique maroon or purple recurved spreading petals which are lepidote on the dorsal surface. In both species the anthers are dehiscent longitudinally. A. atropurpurea is distinct from A. pirreana having larger fewer flowers on longer pedicels and smaller leaves which are lepidote at first on both surfaces.

ARDISIA PIRREANA Lundell, sp. nov. -- Frutex; ramuli graciles, furfuracei; folia parva, petiolata, petiolo lepidoto, 3--5 mm. longo; lamina membranacea, supra glabra, subtus lepidota, lanceolata, 5.5--10 cm. long, 2--3 cm. lata, apice acuminata, basi acuta; inflorescentia terminalis, paniculata, basi foliacea, tenuis, ad 7.5 cm. longa, lepidoto-furfuracea; pedicelli 3--5 mm. longi; flores parvi, corymbosi; sepala 5, ovata, 1--1.5 mm. longa, acuta vel acuminata, asymmetrica, punctata, dorso lepidoto-furfuracea; petala 5, ovato-elliptica,

ca. 1.6 mm. longa, basi coalita, apice apiculata, lepidota, nigropunctata; stamina 5; antherae ovatae, basi cordatae, 1.2--1.4 mm. longae, crassae, apice apiculatae; filamenta ca. 0.5 mm. longa; ovarium ovoideum, stylo 2 mm. longo; ovula 4--7.

Panama: Prov. Darien, Cerro Pirre, ridgetop near Rancho Plastico, alt. 1200 m., July 10--20, 1977, J. P. Folsom, R. Hartman and R. Dressler 4251 (LL, holotype), shrub of 3 m., petals 5, white, recurved, with maroon markings in midarea, fruits red.

This taxon has very small flowers in slender terminal panicles, with lepidote acute sepals 1--1.5 mm. long, recurved thick dorsally lepidote petals about 1.6 mm. long with maroon markings, and very small sessile thick ovate anthers about 1.2 mm. long rigidly apiculate and dehiscent longitudinally. The branchlets, undersurface of leaves, and the inflorescence are all lepidote-furfuraceous with rather small scales. The maroon markings and lepidote dorsal surface of the recurved petals are unusual.

ARDISIA SAPOANA Lundell, sp. nov. -- Frutex glaber; ramuli graciles; folia glabra, nigro-lineato-punctata, petiolata, petiolo anguste marginato, 6--15 mm. longo; lamina glabra, membranacea, integra vel subintegra, anguste elliptica vel oblanceolata, 5.5--12 cm. longa, 2.5--4 cm. lata, apice acuminata, basi attenuata, acuminata; inflorescentia glabra, terminalis, sessilis, paniculata, ca. 2.5 cm. longa; flores corymbosi; pedicelli graciles, ad 1.2 cm. longi, punctati; sepala 5, dense punctata, lanceolata, ca. 3 mm. longa, apice obtusa; corolla ca. 7.2 mm. longa, intus basi papillosa; petala 5, basi connata ca. 2 mm., asymmetrica, punctata, apice acuta; stamina 5, ca. 4 mm. longa, filamentis ca. 0.6 mm. longis, antheris lanceolatis, ca. 3.6 mm. longis apice biperitum dehiscentibus, dorso concoloribus parce punctatis; ovarium glabrum, stylo ca. 4.5 mm. longo; ovula 15.

Panama: Prov. Darien, NE slope of summit, Cerro Sapo, approach from Garachine, E slope, knife edge ridge before ascent to top, elev. 2800 ft., May 9, 1979, B. Hammel 7297 (LL, holotype), shrub 4 m., flowers pink.

The petals are connate at base about 2 mm., but the corolla tube is about 1 mm. long bearing the thick short filaments around the top. At the apex of the tube the base of the petals is glandular-papillose. This taxon is notable for its small sessile inflorescence with bractlets, sepals and petals drying conspicuously black-punctate.

ARDISIA SOLOMONII Lundell, sp. nov. -- Arbor parva; ramuli crassi, apice peradpresse furfuracei; folia pseudoverticillata, petiolata, petiolo anguste marginato, 6--13 mm. longo; lamina subcoriacea, supra glabra, subtus peradpresse lepidoto-furfuracea, anguste oblanceolata, 6--9.5 cm. longa, 1.3--2.5 cm. lata, basi attenuata, apice subabrupte acuminata;

inflorescentia subsessilis, terminalis, ad 7 cm. longa, paniculata, densiflora, furfuracea; flores capitellati, glabri vel subglabri; pedicelli crassiusculi, 1--2.5 mm. longi; sepala 5, late ovata, ca. 1.4 mm. longa, punctata, eroso-ciliolata, symmetrica, apice obtusa; petala 5, convoluta, basi connata, glabra, punctata; stamina subsessilis; antherae lanceolatae, ca. 1.7 mm. longae; ovarium glabrum; ovula 17--20.

Costa Rica: Prov. Puntarenas, Monteverde, elev. ca. 1300 m., cloud forest at edge of continental divide and on Pacific side of slope, Aug. 18, 1976, J. C. Solomon 5392 (LL, holotype), small tree, about 5 m.

The thick branchlets with pseudoverticillate leaves crowded at the apex and small dense terminal inflorescences with numerous small pedicillate flowers in short-stalked heads set A. Solomonii apart.

The pseudoverticillate leaves are suggestive of Conomorpha, and specimens with flowers at anthesis are needed to resolve the generic status of A. Solomonii.

NEOTROPICAL MYRSINACEAE -- IV

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From continuation of studies of the Myrsinaceae of Mexico and Central America, two new genera are described from the Ardisia Sw. complex, and the subgenus Graphardisia Mez is raised to generic status. Nine species described in Rapanea Aubl., all except one from Mexico and Central America, are transferred to Myrsine L. to follow current practice, not out of any conviction as to the justification for this disposition of the taxa! In preparation for a definitive treatment of the family for this region, a review of generic relationships is being made.

Although exploration of the Neotropics has accelerated during the past three decades, and remarkable additions to the flora have been discovered, much remains to be done. Such families as the Myrsinaceae merit special attention. So few collections of species of this family have been made that a high percentage of the taxa are known only from type material. Altogether too many collections are in fruiting stages. For identification and for determination of relationships flowering material is necessary, but such material represents less than a third of specimens in herbaria.

IBARRAEA Lundell, gen. nov. -- Frutices vel arbusculae, foliis alternis, petiolatis, integerrimis; inflorescentiae glabrae, paniculatae rarius simplices racemosae, terminales vel raro axillares; flores pedicellati, racemosi, 5-meri, hermaphroditi; sepala libera, symmetrica, punctata; petala subcarnosa vel subcoriacea, basi connata, lobis patentibus, punctatis, ad faucem zona aurantiace vel flavo-papillosa praeditis; stamina petalis bene breviora, antheris maximis, birimose dehiscentibus, dorso concoloribus epunctatis vel ad thecas parce punctatis, filamentis brevibus latis; ovarium glabrum, ovoideum, stylo stamina superante; placenta pluriseriatim pluri- vel multiovulata; fructus globosus vel subglobosus, 1-spermus.

TYPE SPECIES: Ibarraea mayana (Lundell) Lundell (= Ardisia mayana Lundell).

The genus stands out among all the genera of the family known from the Neotropics in having a large star-shaped corolla eye which is either bright orange or deep yellow. The colored glandular-papillate eye consists of five broad triangular rays which are one-fourth to one-half the length of the thick petals, extending above the corolla throat and opposite the stamens.

The flowers are very colorful, and the natives of Guatemala, who call the plant "chilil," use them during Easter week for decorating the altars of their churches.

The racemose flowers, either in long simple axillary racemes or in terminal panicles of racemes, have mostly elongated rigid pedicels which usually are accrescent post anthesis sometimes giving the racemes a pseudo-corymbose form.

Other features contributing to the distinctness of the genus Ibarraea are the large coriaceous long-petiolate leaves, punctate when dry with conspicuous rounded glands, these distributed over the entire surface, as in I. paschalis (Donn. Sm.) Lundell or restricted to the apex and marginal area, as in I. mayana. The ovules, which are pluriseriate, mostly number in the thirties but some collections from Peten have ovules numbering in the forties and fifties, with the greatest number (64--66) in the generic holotype of I. mayana (Contreras 1162, LL). The large ovate anthers are connivent into an ovoid column supported by the short thick filaments. Except for the flowers, all of the taxa in the genus Ibarraea are strictly glabrous. The branchlets, as well as leaves, dry pallid.

The genus is named in honor of my distinguished colleague, Sr. Jorge A. Ibarra E., noted conservationist, who founded the Museo Nacional de Historia Natural of Guatemala, and has served as its Director since the founding of the institution in 1948.

Ibarraea is known from the southern Mexican states of Veracruz and Chiapas and Tabasco, south through Guatemala and Belize, and into Honduras and El Salvador.

This is a small natural group related to Ardisia Sw.

IBARRAEA AVENDAÑOI (Lundell) Lundell, comb. nov. Ardisia Avendañoi Lundell, Wrightia 6: 61. 1979.

The elliptic leaves, punctate over entire surface, and rounded at apex, the single axillary racemose inflorescences, the broadly ovate sepals glandular-papillate within and densely punctate with minute red-black glands characterize the taxon. I. Avendañoi is known only from fruiting specimens, but it is closely related to I. paschalis (Donn. Sm.) Lundell and I. petenensis (Lundell) Lundell, species with similar leaf punctuation.

IBARRAEA DICHROPETALA (Standl.) Lundell, comb. nov. Ardisia dichropetala Standl., Tropical Woods 37: 29. 1934.

This rare species is restricted apparently to Honduras where it has been collected only twice.

IBARRAEA KARWINSKYANA (Mez) Lundell, comb. nov. Ardisia Karwinskyana Mez, Pflanzenreich IV. Fam. 236: 85. 1902.

The species is known only from the type at Leningrad, which I have not seen. It has not been possible, from description, to associate I. Karwinskyana with any of the other described taxa.

IBARRAEA LEUCOCARPA (Lundell) Lundell, comb. nov. Ardisia leucocarpa Lundell, Wrightia 6: 105. 1980.

It is a white-fruited species, a rarity in the Myrsinaceae.

IBARRAEA LINDENII (Mez) Lundell, comb. nov. Ardisia Lindenii Mez, Pflanzenreich IV. Fam. 236: 86. 1902.

This species and I. mayana (Lundell) Lundell are very closely related. It is common in the lowlands of northern Peten, Guatemala and the adjacent state of Tabasco, Mexico.

IBARRAEA MATUDAE (Lundell) Lundell, comb. nov. Ardisia Matudae Lundell, Lloydia 4: 55. 1941.

Described from Tabasco, Mexico, I. Matudae is very closely related to I. Lindenii.

IBARRAEA MAYANA (Lundell) Lundell, comb. nov. Ardisia mayana Lundell, Wrightia 6: 106. 1980.

The type of the genus Ibarraea, the species is illustrated in the Flora of Guatemala under A. paschalis Donn. Sm. (Fieldiana: Botany, Vol. 24, part VIII, nos. 1 and 2, pp. 135--200, fig. 38. 1966). Contreras 1162 (holotype, LL) was illustrated in fig. 38.

IBARRAEA PASCHALIS (Donn. Sm.) Lundell, comb. nov. Ardisia paschalis Donn. Sm., Bot. Gaz. 18: 5, pl. 1. 1894.

The first species of Ibarraea described, it is beautifully illustrated in the original publication (Bot. Gaz. 19: 5, pl. 1. 1894).

IBARRAEA PETENENSIS (Lundell) Lundell, comb. nov. Ardisia petenensis Lundell, Wrightia 6: 109. 1980.

This distinctive taxon is closely related to I. paschalis (Donn. Sm.) Lundell.

IBARRAEA TONII (Lundell) Lundell, comb. nov. Ardisia Tonii Lundell, Wrightia 6: 111. 1980.

In the absence of flowers, its relationship is doubtful, but the 4- or 5-parted sepals set it apart in the genus Ibarraea. All the other species have 5 sepals.

GRAPHARDISIA (Mez) Lundell, gen. stat. nov. Ardisia subgen. Graphardisia Mez, Pflanzenreich IV. Fam. 236: 59, 78. 1902.

TYPE SPECIES: Graphardisia opegrapha (Oerst.) Lundell (= Ardisia opegrapha Oerst.).

The genus is related to Oerstedianthus Lundell. The two may be separated as follows:

Filaments strictly glabrous; stems and inflorescence glabrous; punctuation of all parts dense and blackish; bracts and bractlets usually foliaceous and often persistent; sepals and petals large, accrescent, usually blackened, usually ribbed or with dense elevated black glands Graphardisia.

Filaments pubescent with gland-tipped hairs; stems and inflorescence rarely glabrous, usually puberulent, hirtellous

or densely hirsute-tomentose; bractlets and sepals small, not accrescent; sepals not ribbed with glands . . . Oerstedianthus.

GRAPHARDISIA BARTLETTII (Lundell) Lundell, comb. nov.
Ardisia Bartlettii Lundell, Contr. Univ. Mich. Herb. 7: 37. 1942.

GRAPHARDISIA BRACTEOLATA (Lundell) Lundell, comb. nov.
Ardisia bracteolata Lundell, Wrightia 6: 65. 1979.

GRAPHARDISIA LEWISII (Lundell) Lundell, comb. nov. Ardisia Lewisii Lundell, Wrightia 4: 146. 1970.

The peculiar inflorescence with incurved acute or acicular bractlets subtending pedicels of the racemose flowers is atypical, and the species is doubtfully referable to this genus.

GRAPHARDISIA LILACINA (Lundell) Lundell, comb. nov.
Ardisia lilacina Lundell, Wrightia 3: 198. 1966.

GRAPHARDISIA OPEGRAPHA (Oerst.) Lundell, comb. nov.
Ardisia opegrapha Oerst., Kjoeb. Vidensk. Meddel. 126. 1861.

The type at Copenhagen, unfortunately in young bud, makes difficult the interpretation of the species in the absence of fully developed flowers.

J. D. Hooker f. (Bot. Mag. t. 6357) illustrates and redescribes Ardisia Oliveri Mast. (Gard. Chron. II. 680. 1877), from a cultivated plant in England. This appears to be a synonym of G. opegrapha (Oerst.) Lundell, as I have treated it in the past.

GRAPHARDISIA PAQUITENSIS (Lundell) Lundell, comb. nov.
Ardisia paquitensis Lundell, Phytologia 2: 4. 1941.

GRAPHARDISIA PICTURATA (Lundell) Lundell, comb. nov.
Ardisia picturata Lundell, Wrightia 4: 164. 1971.

GRAPHARDISIA SEIBERTII (Standl.) Lundell, comb. nov.
Ardisia Seibertii Standl., Ann. Missouri Bot. Gard. 24: 198. 1937.

This is one of the most abundant representatives of the genus judging by the number of collections available. G. Seibertii is the species illustrated in the Flora of Panama from Allen 2226 and 3561 (Ann. Missouri Bot. Gard. 58: 330, fig. 17. 1971). It is not a synonym of Ardisia opegrapha Oerst. to which I assigned it in the Flora.

GRAPHARDISIA SUBCORIACEA (Lundell) Lundell, comb. nov.
Ardisia subcoriacea Lundell, Wrightia 3: 193. 1966.

GRAPHARDISIA VIGOI (Lundell) Lundell, comb. nov.
Ardisia Vigoi Lundell, Wrightia 6: 94. 1979.

G. Vigoi has denticulate leaves while those of G. Wagneri

are crenulate. All other taxa now recognized in Graphardisia have entire leaves.

GRAPHARDISIA WAGNERI (Mez) Lundell, comb. nov. Ardisia Wagneri Mez, Pflanzenreich IV. 236: 79. 1902.

GRAPHARDISIA ZELAYENSIS (Lundell) Lundell, comb. nov. Ardisia zelayensis Lundell, Wrightia 6: 95. 1979.

OERSTEDIANTHUS Lundell, gen. nov. -- Frutices foliis alternis, petiolatis, integerrimis vel crenatis serratisve; inflorescentia paniculata, terminalis; flores 5-meri, hermaphroditi, umbellati vel subcorymbosi; pedicelli gracillimi; sepala 5, libera vel basi coalita; petala 5; stamina petalis haud multo breviora antheris nigricantibus angustis, rimis apice triangulo-dilatatis dehiscentibus, dorso concoloribus nec punctatis, basi filamentis brevibus affixis, filamentis glanduloso-pubescentibus vel raro subglabris; ovarium glabrum, stylo gracillimo antheras superante vel aequante; ovula pluriseriata; bacca globosa vel subglobosa.

TYPE SPECIES: Oerstedianthus nigrescens (Oerst.) Lundell (= Ardisia nigrescens Oerst.).

The shrubs have branchlets strictly glabrous, minutely puberulent, hirtellous or hirsute-tomentose, the hairs of flower parts sometimes gland-tipped. Pubescence of other parts ranges from puberulent to short pilose with filaments usually pubescent with short gland-tipped hairs. The distinctive anthers are narrowly triangular-linear, usually blackish, attached near base with basal lobes subsagittate or rarely bulbous. They are dehiscent by apical pores which are triangular and usually spreading. The dorsal surface of anthers is epunctate, and the apex is acute-apiculate to cuspidulate.

Oerstedianthus is related to Graphardisia (Mez) Lundell. Both have similar linear-lanceolate anthers which dehisce by apical pores.

The genus is dedicated to A. S. Oersted, pioneer student of the neotropical flora, who described the type species.

OERSTEDIANTHUS BREVIPES (Lundell) Lundell, comb. nov. Ardisia brevipes Lundell, Wrightia 3: 97. 1964.

OERSTEDIANTHUS DONNELL-SMITHII (Mez) Lundell, comb. nov. Ardisia Donnell-Smithii Mez, Bull. Herb. Boiss. ser II, 3: 235. 1903.

OERSTEDIANTHUS ERYTHROCARPUS (Lundell) Lundell, comb. nov. Ardisia erythrocarpa Lundell, Wrightia 2: 59. 1960.

OERSTEDIANTHUS HIRTELLUS (Lundell) Lundell, comb. nov. Ardisia hirtella Lundell, Wrightia 3: 98. 1964.

OERSTEDIANTHUS MITCHELLAE (I. M. Johnston) Lundell, comb. nov. Ardisia Mitchellae I. M. Johnston, Contr. Gray Herb. 81: 96. 1928.

OERSTEDIANTHUS NIGRESCENS (Oerst.) Lundell, comb. nov. Ardisia nigrescens Oerst., Vid. Medd. Kjoebenhavn 130. 1861.

OERSTEDIANTHUS TRINITARIAE (Lundell) Lundell, comb. nov. Ardisia trinitariae Lundell, Wrightia 5: 62. 1974.

OERSTEDIANTHUS TUERCKHEIMII (Donn. Sm.) Lundell, comb. nov. Ardisia Tuerckheimii Donn. Sm., Bot. Gaz. 13: 74. 1888.

OERSTEDIANTHUS TUXTEPECANUS (Lundell) Lundell, comb. nov. Ardisia tuxtepecana Lundell, Wrightia 5: 63. 1974.

MYRSINE ALLENII (Lundell) Lundell, comb. nov. Rapanea Allenii Lundell, Wrightia 4: 168. 1971.

MYRSINE CALCARATA (Lundell) Lundell, comb. nov. Rapanea calcarata Lundell, Wrightia 5: 295. 1976.

MYRSINE JURGENSENII (Mez) Lundell, comb. nov. Rapanea Jurgensenii Mez, Pflanzenreich IV, Fam. 236: 388. 1902.

MYRSINE MEXICANA (Lundell) Lundell, comb. nov. Rapanea mexicana Lundell, Wrightia 5: 296. 1976.

MYRSINE PANAMENSIS (Lundell) Lundell, comb. nov. Rapanea panamensis Lundell, Wrightia 4: 169. 1971.

MYRSINE PERUVIANA (Lundell) Lundell, comb. nov. Rapanea peruviana Lundell, Wrightia 6: 117. 1980.

MYRSINE PITTIERI (Mez) Lundell, comb. nov. Rapanea Pittieri Mez, Pflanzenreich IV, Fam. 236: 378. 1902.

MYRSINE REFLEXIFLORA (Lundell) Lundell, comb. nov. Rapanea reflexiflora Lundell, Wrightia 5: 297. 1976.

MYRSINE RUFA (Lundell) Lundell, comb. nov. Rapanea rufa Lundell, Wrightia 5: 298. 1976.

ADDITIONS TO CYANEA (LOBELIACEAE) OF OAHU AND MAUI

HAWAIIAN PLANT STUDIES 106

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Cyanea occultans sp. nov. (sect. Delissoideae). Fig. 1.

Diagnosis Holotypi: Frutex 1 m altus glaber caule simpliciter est, petiolis 3-6 cm longis gracilibus, laminis 17-20 cm longis 4.5-5.3 cm latis chartaceis ellipticis apice acuminato basi longe anguste cuneata marginibus integris supra obscure viridibus subtus subalbe viridibus nervis secundariis 17-20 in dimidio quoque arcuate ascendentibus, racemis 3.5-5 cm longis 7-15-floriferis, pedunculo 10-15 mm longo, bracteis caducis, rhachidibus 10-20 mm longis, pedicellis 8-10 mm longis, hypanthio 2-3 mm longo cupulato glabro, lobis calycis 0.7-1 mm longis deltoideis, corollis albis glabris 25 mm longis tubo 15-18 mm longo 1.8 mm diametro tubuloso paulum decurvato, columna filamentarum 23 mm longa glabra alba, antheris nigris eis superis 5.5 mm longis illis inferis 4 mm longis in apice cum setis albis 1 mm longis penicillatis, (fructibus incognitis).

Diagnosis of Holotype: Shrub 1 m tall, glabrous, single stemmed; petioles 3-6 cm long, slender; blades 17-20 cm long, 4.5-5.3 cm wide, chartaceous, elliptic, the apex acuminate, the base long narrow cuneate, the margins entire, above dark green, below whitish green, secondary veins 17-20 in each half, arcuate ascending; racemes 3.5-5 cm long, 7-15-flowered; peduncle 10-15 mm long; bracts caducous; rhachis 10-20 mm long; pedicels 8-10 mm long; hypanthium 2-3 mm long, cupulate, glabrous; calyx lobes 0.7-1 mm long, deltoid; corolla white, glabrous, 25 mm long, the tube 15-18 mm long, 1.8 mm in diameter, tubular, gently decurved; filament column 23 mm long, glabrous, white; anthers black, the upper ones 5.5 mm long, the lower ones 4 mm long, white penicillate at apex with bristles 1 mm long; (fruit unknown).

Holotypus: Hawaiian Islands, Oahu Island, Kaaawa, Hidden Valley, moist river bed, under canopy of Aleurites and Pisonia, with Athyrium, 457 m (1,500 ft) alt., Nov. 2, 1980, J. Obata & D. Palmer 433 (BISH).

Discussion: The collectors observed at the type locality three adult plants and eight seedlings.

This new species is a member of the section Delissoideae, as is its closest relative, C. glabra (E. Wimm.)

St. John, of Maui, a species with the peduncle 15-25 mm long; anther tube 7 mm long; blades 28/8 cm, oblanceolate, the apex acute, the base shortly cuneate, in the apical half of the blade the margins broadly low dentate; calyx lobes 2-3 mm long, lanceolate; and the corolla 40 mm long. C. occultans has the peduncle 10-15 mm long; anther tube 5.5 mm long; blades 17-20 X 4.5-5.3 cm, elliptic, the apex acuminate, the base long narrow cuneate, the margins entire; calyx lobes 0.7-1 mm long, deltoid; and the corolla 25 mm long.

The new epithet is the Latin participle, occultans, being hidden, and it refers to the type locality, the Hidden Valley.

Cyanea glabra (E. Wimm.) comb. nov.

C. Knudsenii Rock, var. glabra E. Wimm., in Engler's Pflanzensreich IV, 276b: 75, 1956.

Holotype: Hawaiian Islands, east Maui Island, Honomanu Gulch, west bank, June 24, 1920, C. N. Forbes 2,598.M. (BISH).

Discussion: C. Knudsenii Rock has the peduncle 2-5 cm long, puberulent; pedicels puberulent; hypanthium appressed puberulous; calyx lobes 2-2.5 mm long, deltoid, appressed puberulous; corolla 4.5-5 cm long, densely ascending puberulous; blades coarsely broadly dentate on the outer third. C. glabra differs by having the peduncle 1.3 cm long, glabrous; pedicels glabrous; hypanthium glabrous; calyx lobes 2.5-3 mm long, lanceolate, glabrous; corolla 3.5 (?) cm long, glabrous; and the blades merely minutely umbonate at the veinlet tips.

Another, but less similar species, is C. profuga of Molokai.

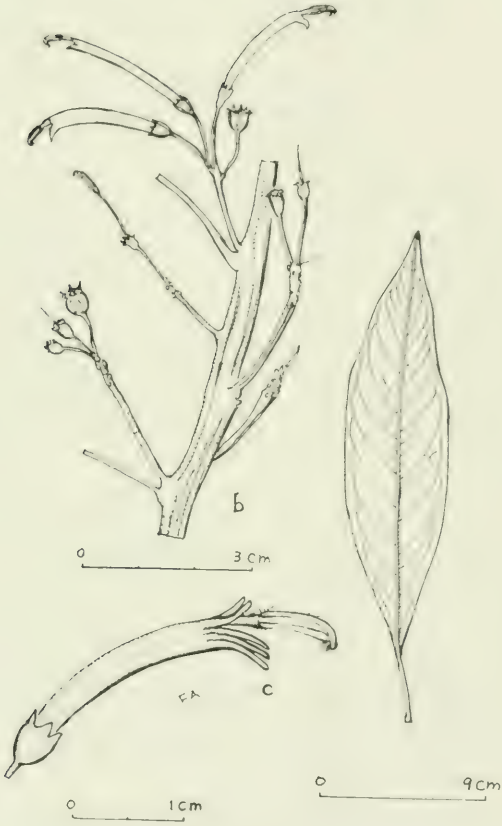


Fig. 1

STUDIES ON THE MARYLAND FLORA VII:

ADDITION OF CYPERUS HOUGHTONII TORR. AND JUNCUS TRIFIDUS VAR.

MONANTHOS (JACQ.) BLUFF & FING. TO THE STATE FLORA

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Baltimore, Maryland 21228

The diversity of the Maryland flora is largely attributed to its geologic and physiographic complexity. In spite of a small land area, five physiographic provinces (the Appalachian, Ridge and Valley, Blue Ridge, Piedmont, and Coastal Plain Provinces) traverse the State and display a remarkable sequence of geologic formations, each of which often supports a characteristic and local flora. Although the Maryland flora in general has been extensively studied and has attracted the interests of such noteworthy early botanists as Kalm (1770) and Rafinesque (1832), systematic studies of local geologic formations, edaphic districts, and unusual forest types in Maryland continues to reward careful collectors with additions to the known flora.

This note reports the recent discovery of Cyperus Houghtonii Torr. and Juncus trifidus var. monanthos (Jacq.) Bluff & Fing. by the author during a continuing study of the flora of local geologic formations. These records are here presented as first reports for the State. Neither species is included in the treatments of the Maryland flora given by Fischler (1977), Fisher et al. (UNDATED), Herman (1946), Hickey (1975), Higgins et al. (1971), Higman (1968), Hotchkiss and Stewart (1947), Kologiski et al. (1974), Krauss et al. (1971), Mercer (1968), Monteferrante (1973), Norton and Brown (1946), Phillip and Brown (1965), Sipple (1978), Stieber (1974), Tatnall (1946), Terrell (1970), Thompson (1974), Wass (1972) and Witman (1954).

Cyperus Houghtonii Torr. occurs in dry, especially sandy soil from Quebec to Manitoba, south to Virginia and North Carolina and northwest to Iowa (Gleason and Cronquist 1963, Radford et al. 1968). Although this umbrella-sedge has a rather extensive distribution throughout the central and northeastern U.S., it is not of frequent occurrence and is extremely local towards the southern limit of its range. I have collected it in Maryland at the following two localities - Ridge and Valley Province, Allegany Co., E. slope of the sandstone escarpments of the Cumberland Narrows, grassy balds near Lovers Leap and sandy slope on the margins of a powerline right-of-way in accumulated sandstone debris, 7-26-80, Riefner 80293; Coastal Plain Province, Worcester Co., sand barrens on the barrier island of Ocean City, near 100 St. and Costal Hwy. before pine barrens, 9-20-80, Riefner 80380. The Ocean City locality represents the only known station on the entire Delmarva Peninsula (pers. comm. Dr. Norman Dill, Delaware State College).

This species has been nominated for rare status in North Carolina by Hardin et al. (1977), in Virginia by Porter (1979), and in Pennsylvania by Wiegman (1979). Although additional review may be necessary to ascertain that these occurrences are natural and not artificial introductions, the species should be considered for inclusion in the list of rare Maryland plants.

Juncus trifidus var. monanthos (Jacq.) Bluff & Fing. occurs locally in exposed rock crevices and cliff ledges at higher elevations in the mountains of Virginia, North Carolina and Tennessee (Gleason and Cronquist 1963, Radford et al. 1968). I collected this variety on the W. slope of the steep-sided, sandstone escarpments of the Cumberland Narrows, in exposed crevices at middle and upper cliff elevations, Ridge and Valley Province, Allegany Co., 7-26-80, Riefner 80294. This single Maryland station represents a northern extension of the known range by approximately 75 miles from the nearest population growing on greenstone cliffs in Page Co., Virginia. This taxon has been nominated for rare and endangered status in North Carolina by Hardin et al. (1977) and in Virginia by Porter (1979), and is here proposed as a candidate for addition to the rare and endangered list prepared for Maryland by Broome et al. (1979). The Cumberland Narrows is the finest exposure of the Juniata formation in Maryland. Intensive survey of other rugged sites similar to the Cumberland Narrows in the Ridge and Valley Province in West Virginia and Pennsylvania, may reveal additional populations of the one-flowered rush.

The discovery of Cyperus Houghtonii Torr. and Juncus trifidus var. monanthos (Jacq.) Bluff and Fing. in Maryland, indicates that present-day knowledge of the State's flora is still incomplete. Relatively inconspicuous, these species apparently escaped detection by earlier botanists. It is hoped that these records will stimulate new interest in the floristic plant geography of Maryland, and initiate more intensive and systematic collecting programs within the State. Voucher specimens have been placed in the Herbarium of the University of Maryland at College Park (MARY).

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ADDITIONAL NOTES ON THE GENUS *LIPPIA*. XVI

Harold N. Moldenke

For a detailed explanation of the herbarium acronyms employed in this and all others in my series of papers in this journal since 1932 see *Phytologia Memoirs* 2: 463--469 (1980) with the following additions: Gz = University of Graz, Graz, Austria (GZU) and Ne = Northeast Louisiana University, Monroe, Louisiana.

LIPPIA Houst.

Additional synonymy: *Lippia* (L.) Kunth ex Meisn., *Pl. Vasc. Gen.* 2: 199. 1840.

Additional & emended bibliography: L., *Syst. Nat.*, ed. 1, 26. 1740; Gled., *Berl.* 5: 130. 1749; L., *Philos. Bot.* 32, 155, 173, & 337. 1751; B. Juss., *Hort. Trian.* 1759; L., *Syst. Nat.*, ed. 10. 2: 1119. 1759; L., *Sp. Pl.*, ed. 2, imp. 1, 2: 883. 1763; Gled., *Syst.* 174. 1764; L., *Gen. Pl.*, ed. 6, *Ord. Nat.* 1764; L., *Syst. Nat.*, ed. 12 rev. ["13"], 423. 1767; J. A. Murr. in L., *Syst. Veg.*, ed. 12, 480. 1774; Reichenb., *Gen.* 324. 1778; J. A. Murr. in L., *Syst. Veg.*, ed. 14, 574. 1784; Medic., *Phil. Bot.* 1: 180. 1789; J. F. Gmel. in L., *Syst. Nat.*, ed. 13, imp. 2, 1: 955. 1791; Poir. in Lam., *Tabl. Encycl. M  th. Bot.* [Illustr. Gen.] 1: 59. 1791; Gis., *Carl. Linn. Prael. Ord. Nat.* 520. 1792; Pers. in L., *Syst. Veg.*, ed. 15, 611. 1797; Willd. in L., *Sp. Pl.*, ed. 4, 3: 319 & 356. 1800; Cram., *Disp.* 143. 1803; St.-Hil., *Expos.* 1: 250. 1805; Spreng., *Anleit.* 2 (1): 426. 1817; Poir. in Lam., *Tabl. Encycl. M  th. Bot.* 3: pl. 539, fig. 1 & 2. 1819; Steud., *Nom. Bot. Phan.*, ed. 1, 111, 485--486, 873, & 898. 1821; Link, *Enum.* 2: 126. 1822; Poir., *Dict.* 27: 9. 1823; Poir. in Lam., *Tabl. Encycl. M  th. Bot.* 4: 55 & 91. 1823; Bartl., *Ord.* 180. 1830; Loud., *Hort. Brit.*, ed. 1, 246 & 529. 1830; Schlecht. & Cham., *Linnaea* 6: 372. 1831; Spreng., *Gen. Pl.* 2: 417. 1831; Cham., *Linnaea* 7: 213--243, 253, & 375--379, pl. 7, fig. C & D. 1832; Loud., *Hort. Brit.*, ed. 2, 246 & 529. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 246 & 529. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 553. 1839; Meisn., *Pl. Vasc. Gen.* 2: 199. 1840; Endl., *Ench.* 312. 1841; Reichenb., *Nom.* 108. 1841; Brongn., *Enum. Gen.* 65. 1843; D. Dietr., *Syn. Pl.* 3: 596--600, 609, & 610. 1843; Hassk., *Cat. Pl. Hort. Bot. Bogor. Cult. Alt.* 134. 1844; A. L. Juss. in Orbigny, *Dict. Univ. Hist. Nat.* 13: 185. 1849; Ledeb., *Ross.* 3: 330. 1849; Wight, *Icon. Pl. Ind. Orient.* 4 (3): 11, pl. 1463. 1849; Miq., *Fl. Ind. Bat.* 2: 905. 1857; Miq., *Fl. Ind. Bat. Suppl.* 1: 244. 1860; Peters, *Naturwiss. Reise Mossamb.* 6 (1): Bot. 256. 1861; Turcz., *Bull. Soc. Imp. Mosc.* 36 (2): 200--205. 1863; Kurz, *Rep. Veg. Andam. App.* A: 45. 1870; Miers, *Trans. Linn. Soc. Lond. Bot.* 27: 103. 1871; Ulrich, *Internat. W  rterb.*, ed. 1, 128. 1871; Pfeiffer, *Nom. Bot.* 2 (1): 132 (1874) and 2 (2): 1569, 1570, & 1647. 1874; Ulrich, *Internat. W  rterb.*, ed. 2, 128. 1875; Griseb., *Abhandl. K. Gesel. Wiss. G  tt.* 24: [Symb. Fl. Argent.] 278. 1879; Fern.-Villar in Blanco, *Fl. Filip.*, ed. 3, 4: Nov. App. 157. 1880; Caruel in Parlatore, *Fl. Ital.* 6: 331--332. 1884; Balf. f.,

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It is perhaps worth noting here that Caruel (1884) is among those botanists who correctly accredit the name *Lippia* to Hous-toun. The *Zappania* Scop., listed as a synonym of *Lippia* by Spach (1840), actually is a synonym of *Phyla* Lour.

Although the Baileys (1976) definitely state that the true genus *Lippia* is not cultivated in the United States and Canada, *L. alba* (Mill.) N. E. Br. actually does occur in cultivation at least in Maryland and Pennsylvania.

Pobéguin (1906) describes an unidentified species of *Lippia* from the Republic of Guinea, based on Bambaya 26, as a "Plante très commune, 1 m. à 1 m. 50 de haut; fleurs blanches en glomérules par 4 à l'aisselle des feuilles; feuilles verticillées vert clair, odorantes; existe en plusieurs variétés à odeurs différentes. Les indigènes se servent des feuilles en infusion." It is probable that he is here referring to *L. abyssinica* (Otto & Dietr.) Cuf., *L. chevalierii* Mold., *L. multiflora* Mold., and/or *L. rugosa* A. Chev., all known from that country and all quite similar in appearance.

Lindquist (1978) records the fungus, *Prospodium tumefaciens* Lindq., as parasitizing the leaves of an unidentified species of *Lippia* in Córdoba, Argentina.

The Dressler 2304 and Eichenwald s.n. [May 2, 1954], distributed as *Lippia*, actually are *Lantana achyranthifolia* Desf., while Shepherd, Semir, Andrade, & Salgado 7244 is *L. aristata* (Schau.) Briq., Mori & Santos 11848 is *Lantana canescens* H.B.K., Matuda & al. 31225 is *L. frutilla* Mold., W. Hoehne 5583 is *Lantana fucata* Lindl., Enriquez 676 is *L. involucrata* L., Tharp & York 51-135 & 51-142 are *L. macropoda* Torr., Fournier 143 is *L. peduncularis* Anderss., Dorantes & al. 1435 is *L. velutina* f. *albifructa* Mold., Barkley, Paxson, & Webster 2571 is *L. velutina* f. *violacea* Mold., and Chavelas, González, & Pérez 2236 and Héninger & al. 564 are not verbenaceous.

LIPPIA ABYSSINICA (Otto & Dietr.) Cuf.

Additional bibliography: D. Dietr., Syn. Pl. 3: 609. 1843; R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Kong. Exped. Bot. 2 (2): 273. 1916; Good & Exell, Journ. Bot. 68: Suppl. 2: 139. 1930; H. N. & A. L. Mold., Pl. Life 2: 80 & 81. 1948; Dithens, Afric. Handb. 8: [Drug Pl. Afr.] 94. 1949; Mold., Biol. Abstr. 65: 6768 (1978) and 66: 1277. 1978; Mold., Phytologia 39: 434. 1978; Hocking, Excerpt. Bot. A.33: 86 & 88. 1979; Mold., Phytol. Mem. 2: 200, 202, 203, 205--208, 210, 211, 213, 217, 220, 223, 224, 227, 231, 233, 357, 419, & 558. 1980.

Dithens (1949) reports that this plant is used medicinally to treat fevers, colds, and colic in Africa. Fries (1916) cites his no. 1887 from Kasindi.

LIPPIA ABYSSINICA var. *PUBESCENS* (Mold.) Mold.

Additional bibliography: Mold., Biol. Abstr. 65: 6768 (1978) and 66: 1277. 1978; Mold., Phytologia 38: 385. 1978; Hocking, Excerpt. Bot. A.33: 86 & 87. 1979; Mold., Phytol. Mem. 2: 203, 224, & 558. 1980.

LIPPIA ACUMINATA C. Wright

Emended synonymy: *Lippia acuminata* "W. ex Griseb." apud A-

lain in León & Alain, Fl. Cuba, imp. 1, 4: 289. 1957.

Additional & emended bibliography: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 288--289. 1957; Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 385. 1978; Mold., Phytol. Mem. 2: 90 & 558. 1980.

LIPPIA ACUTIDENS Mart. & Schau.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 385. 1978; Mold., Phytol. Mem. 2: 147 & 558. 1980.

Recent collectors describe this species as erect and xylopodiferous, with rose-colored corollas, and have found it growing in sandy soil on campo cerrado, at 800--950 m. altitude, flowering in July.

Additional citations: BRAZIL: Goiás: *Hatschbach & Guimaraes* 42274 (Ld), 42324 (Ld).

LIPPIA ADPRESSA Hayek

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 385--386. 1978; Mold., Phytol. Mem. 2: 147 & 558. 1980.

LIPPIA AFFINIS Schau.

Additional bibliography: Mold., Phytologia 38: 386 (1978) and 40: 67. 1978; Mold., Phytol. Mem. 2: 147, 174, & 558. 1980.

LIPPIA ALBA (Mill.) N. E. Br.

Additional & emended bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illust. Gen.] 1: 58. 1791; D. Dietr., Syn. Pl. 3: 596, 597, 609, & 610. 1843; Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 292. 1888; Reiche & Phil. in Reiche, Estud. Crit. Fl. Chile 5: 298 & 301--302. 1910; Sanzin, Anal. Soc. Cient. Argent. 88: 102, 103, & 133. 1919; Haines, Bot. Bihar Orissa, ed. 1, 4: 7-5 & 7-6. 1922; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 599--602. 1927; Hieron., Pl. Diafor. 225. 1930; Stahl, Estud. Fl. Puerto Rico, ed. 2, 3: 292. 1937; González & Lombardo, Anot. Fitoter. Vern. Urug. 9. 1946; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 288--289, fig. 124. 1957; Fester & al., Anal. Asoc. Quím. Argent. 45: 185--189. 1957; Haines, Bot. Bihar Orissa, ed. 2, 2: 739 & 740. 1961; Fournet, Fl. Illust. Phan. Guad. Mart. 1397--1399. 1978; Mold., Phytologia 41: 131--133. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 40 & 53. 1978; Hocking, Excerpt. Bot. A.33: 87 & 91. 1979; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 217. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 27. 1979; Troncoso in Burkart, Fl. Illustr. Entre Rios 5: 272--275, fig. 129. 1979; Mold., Phytol. Mem. 2: 23, 49, 64, 72, 74, 76, 77, 79, 81, 84, 90, 92, 94, 95, 97, 98, 101, 10-, 104, 105, 109, 116, 122, 124, 126, 129, 134, 147, 174, 177, 180, 188, 263, 337, 357, 414, 419, 420, 423, 558, & 628. 1980; Wiggins, Fl. Baja Calif. 529 & 530. 1980.

Additional illustrations: Alain in León & Alain, Fl. Cuba, imp.

1, 4: 288, fig. 124. 1957; Troncoso in Burkart. Fl. Ilustr. Entre Ríos 274, fig. 129. 1979.

Recent collectors describe this plant as a low spreading shrub, 1--1.5 m. tall, with green bracts, and have encountered it in forests and woody pastizal, at 200--800 m. altitude, in anthesis in July and August. The corollas are said to have been "pink" on Hart 1215, "reddish" on Austin & al. 7381, and "purple" on Stevens 9440.

Knuth (1927) cites from Venezuela the following collections: Bermudez: Humboldt & Bonpland s.n. Bolívar: Humboldt & Bonpland s.n. Federal District: Pittier 6172 & 7029. Margarita Island: Johnston 81, Miller & Johnston 125. He records the vernacular name, "cariaquito blanco". Other authors have listed "herva cidreira", "romerillo", "salvia", "salvia de campo", "salvia de monte", "salvia morada", "salvia trepadora", "saúge de la Barbade", "saúge du Brésil", "thé de Chine", and "yerba buena".

Troncoso (1979) cites from Entre Ríos, Argentina: Baez 147, Boelcke 1248, Burkart 8792, 12899, 21363, 21364, 21365, 22291, & 23095, Correa & Bacigalupo s.n., Lorentz s.n., Meyer 10888, and Nicora 3282, some of these collections actually being from Almirón, Curuzú, Espinillo, and Lechiguana islands. She comments that "Existen ejemplares de esta especie más gráciles, de hojas más angostas y oblongas, de 2--3 (2.5, 5) cm long. x 1--2, 3 cm lat., cabezuelas más pequeñas y pubescencia en general más breve y laxa. [This is the true *L. alba* --H.N.M.]. Estas diferencias permitirían considerarlos como una variedad de *L. alba*, pero la presencia de algunos ejemplares intermedios impide, por el momento, establecer una verdadera delimitación.....*Lippia alba* es muy empleada en la farmacopea popular. Diversos autores señalan su acción estimulante y antiespasmódica.....Especie, además, muy rica en aceites esenciales. Fester....y colab.....señalan la presencia de lippiona y piperitona, prevaleciendo una u otra de estas esencias en distintas muestras procedentes en Entre Ríos. Según estos autores, podría tener valor industrial el cultivo de *Lippia alba* para la producción de piperitona, materia prima para el mentol artificial."

The *L. alba* described by Wiggins (1980) from Baja California actually is var. *carterae* Mold.

Material of *Lippia alba* is often misidentified and distributed as *Lantana* sp. On the other hand, the *Cantu* 83, distributed as *Lippia alba*, actually is *L. graveolens* H.B.K., while Fosberg & Nasir 56922 is *Lantana indica* var. *albiflora* Wight and Ortiz 1780 is *Lantana microcephala* A. Rich.

Additional citations: TEXAS: Hidalgo Co.: Lawson & al. 483 (Ne--71512); Thomas, Marx, & Allen 39449 (Ne--92562). NICARAGUA: Matagalpa: W. D. Stevens 9440 (Ld). ECUADOR: Morona-Santiago: J. Hart 1215 (F--2600513). BRAZIL: Amapá: Austin, Nauman, Rabelo, Rosário, & Santos 7381 (Ld). BOLIVIA: El Beni: Feljanty 13 (Z).

LIPPIA ALBA var. *CARTERAE* Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 401. 1978; Mold., Phytol. Mem. 2: 64 & 558.

1980; Wiggins, Fl. Baja Calif. 530. 1980.

Wiggins (1980) erroneously lists this taxon as typical *Lippia alba*, which is lavender-flowered.

LIPPIA ALBA var. *GLOBIFLORA* (L'Hér.) Mold.

Emended synonymy: *Lippia geminata* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 486. 1821.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 486 (1821) and ed. 2, 2: 54 & 750. 1841; D. Dietr., Syn. Pl. 3: 597 & 610. 1843; Griseb., Abhandl. K. Gesell. Wiss. Götting. 24: [Symb. Fl. Argent.] 278. 1879; Herzog, Meded. Rijks Herb. Leid. 29: 41. 1916; Mold., Phytologia 41: 132--133. 1978; Hocking, Excerpt. Bot. A.33: 87. 1979; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 217. 1979; Lopez-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytol. Mem. 2: 64, 116, 124, 126, 129, 134, 147, 174, 177, 180, 188, 357, 416. 419, 420, 449, 452, 462, 463, & 558. 1980.

Kummrow reports that this plant is used medicinally in Brazil. The corollas are said to have been "lilac" in color on *Kummrow 1259* when fresh.

Additional citations: BRAZIL: Goiás: *Hatschbach 34570* (W--2839472). CULTIVATED: Brazil: *Kummrow 1259* (Ld).

LIPPIA ALNIFOLIA Schau.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 474. 1978; Mold., Phytol. Mem. 2: 147 & 558. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Recent collectors describe this species as a bushy shrub, 1.5--2.5 m. tall, the leaves coriaceous, aromatic, rugose, dark glossy-green above, gray-green beneath, the bracts pale-green, the corollas "pale-pink with yellow-orange throat", and have found it growing among rocks in a region of sandstone, metamorphic, and quartzite rock outcrops associated with marsh and damp flushes and on campo rupestre, at 1000--1500 m. altitude, flowering in March and July, and fruiting in July. On *Mori & al. 12420* the corollas are said to have been light-lilac "com uma mancha de amarela no centro".

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley 19763* (N, Z); *Mori, King, Santos, & Hage 12420* (Ld, W--2854268), *12613* (Ld, W--2854281).

LIPPIA AMERICANA L.

Additional bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 539, fig. 1 & 2 (1819) and 4: 55 & 91. 1823; Pfeiffer, Nom. Bot. 2 (1): 134. 1874; Mold., Phytologia 41: 133. 1978; R. F. Sm., Act. Bot. Venez. 13: 193, 206, & 263, fig. 152. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 271. 1979; Mold., Phytol. Mem. 2: 64, 84, 109, 129, 130, 134, 420, & 558. 1980.

Additional & emended illustrations: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 539, fig. 1 & 2; R. F. Sm., Act. Bot. Vèn-

ez. 263, fig. 152. 1978.

Recent collectors have encountered this plant in forests and in "very disturbed areas", at 50--150 m. altitudes, flowering in October and November, and describe it as a shrub, 2 m. tall. The corollas are said to have been "white" on Kirkbride 2466 & 2634. Smith (1978) describes the species as follows: "Hoja rugosa con denticulos en su mitad distal. Pecíolo y tallos jóvenes pubescentes de olor fuerte. Casi siempre con cabezuelas de flores. Tallo cuadrangular en corte transv. Arbusto secundario de zona cálida." It should be pointed out that on p. 193 of his work the figure illustrating this species is incorrectly given as "151".

Additional citations: COLOMBIA: Magdalena: Kirkbride 2466 (N, W--2834901), 2634 (W--2835021).

LIPPIA AMERICANA f. *HYPTOIDES* (Benth.) Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 475 & 476. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytol. Mem. 2: 109, 129, 130, 134, & 558. 1980.

LIPPIA AMERICANA f. *PILOSA* Mold.

Additional bibliography: Record & Hess, Timb. New World 544. 1943; Mold., Phytologia 41: 133. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytol. Mem. 2: 84, 109, 116, 129, & 558. 1980.

Recent collectors describe this plant as shrubby, with elongated spreading stems, the leaves aromatic, dull-green above, paler beneath, and the bracts pale-green, and have encountered it at 500 m. altitude, flowering in December. The corollas are said to have been "white" on Steyermark & Espinoza 108760.

Additional citations: VENEZUELA: Lara: Steyermark & Espinoza 108760 (N). Zulia: Aristeguieta 2058 (W--2882048).

LIPPIA ANGUSTIFOLIA Cham.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 477--478 (1978) and 39: 166. 1978; Mold., Phytol. Mem. 2: 147, 177, 188, & 558. 1980.

Recent collectors have found this plant growing in quebrachal, flowering and fruiting in December. The corollas are said to have been "bright-yellow" on Schinini 19612.

Additional citations: PARAGUAY: Schinini 19612 (N).

LIPPIA ANTAICA Loes. & Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 478. 1978; Mold., Phytol. Mem. 2: 134 & 558. 1980.

LIPPIA ARBOREA Rojas

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 478. 1978; Mold., Phytol. Mem. 2: 198 & 558. 1980.

LIPPIA ARECHAVALETAE Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 39: 435. 1978; Troncoso in Burkart, Il. Ilust. Entre Rios 5: 272 & 278--280, fig. 132. 1979; Mold., Phytol. Mem. 2: 147, 177, 180, 188, & 558. 1980.

Illustrations: Troncoso in Burkart, Fl. Ilust. Entre Rios 5: 279, fig. 132. 1979.

Hatschbach describes this plant as xylopodiferous, with yellow "flowers" [corollas], and encountered it on campo limpo, flowering in September.

Troncoso (1979) cites the following collections from Entre Rios, Argentina, noting that the flowers are definitely *diclinous*: Burkart 21882, 21884, 22697, 22698, 23099, & 26356, Cabrera 10797, Herb. Inst. Darwinian 25669, Hunziker 4531, Lorentz 356 & s.n., and Ragonese & Guaglianone s.n.

Additional citations: BRAZIL: Paraná: Hatschbach 37924 (Eu--37821).

LIPPIA ARECHAVALETAE var. *MICROPHYLLA* Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 479. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

LIPPIA ASPERRIMA Cham.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 39: 435 (1978) and 40: 78. 1978; Troncoso in Burkart, Fl. Ilust. Entre Rios 5: 272 & 275--278, fig. 130 1--x. 1979; Mold., Phytologia 47: 88. 1980; Mold., Phytol. Mem. 2: 147, 175, 177, 180, 188, & 559. 1980.

Illustrations: Troncoso in Burkart, Fl. Ilust. Entre Rios 5: 276, fig. 130 1--x. 1979.

Recent collectors have encountered this plant growing on high campo, flowering in September. The corollas are described as having been "intense yellow" on *Schinini & Bordas* 13335.

Troncoso (1979) asserts that this species is definitely *diclinous* in regard to its flowers and that it "Habita en lugares humedos, campos virgenes o bordes de selva en galeria". She cites the following collections from Entre Rios, Argentina: Burkart 1084, 22704, 24013, 24228, 26350, 28068, & 30281 and Hauman s.n.

The Morel 4353 and Pedersen 9650, previously cited by me as the typical form of this species, are now regarded as representing *f. angustifolia* Mold.

Additional citations: PARAGUAY: *Schinini & Bordas* 13335 (N).

LIPPIA ASPERRIMA f. *ANGUSTIFOLIA* Mold., Phytologia 47: 88. 1980.

Bibliography: Mold., Phytologia 47: 88. 1980; Mold., Phytol. Mem. 2: 188. 1980.

This narrow-leaved form has been found growing in dry sandy grasslands, flowering in January and February, fruiting in February. The material cited below was previously erroneously regarded by me and cited as typical *L. asperrima* Cham.

Citations: ARGENTINA: Corrientes: Pedersen 9650 (W--2883187). For-

mosa: Morel 4353 (N--type).

LIPPIA ASPERRIMA var. *LONGIPEDUNCULATA* Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 480. 1978; Mold., Phytol. Mem. 2: 177, 180, 188, & 559. 1980.

LIPPIA ASPERRIMA var. *ROTUNDATA* Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 479 & 480. 1978; Mold., Phytol. Mem. 2: 147, 188, & 559. 1980.

LIPPIA BAHIENSIS Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 39: 435. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Recent collectors describe this plant as a slender subshrub or shrublet, 20--45 cm. tall, the leaves aromatic or slightly so, dark-green or grayish-green above, paler beneath, plicate, the bracts green, and have found it growing in grassland in an area of dry grassland on quartzite and white sand, apparently subject to flooding, with red lateritic soils in the valleys with cerrado, as well as in "caatinga on sand and with quartzitic rocks and metamorphosed sandstones forming rock areas with more open vegetation including an extensive area of *Vellozia*", at 1000 m. altitude, flowering in February and March. The corollas are said to have been "lilac, throat yellow with white surrounding" on Harley 18934 and "pink with darker pink tube, yellow in throat" on Harley 20053.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18934 (N, Z), 20053 (K).

LIPPIA BALANSAE Briq.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 480--481. 1978; Mold., Phytol. Mem. 2: 147, 177, & 559. 1980.

Hatschbach describes this plant as a shrub, 1.3 m. tall, with lilac flowers, and found it growing in cerrado, flowering and fruiting in October.

Additional citations: BRAZIL: Mato Grosso: Hatschbach 38696 (W--2850788). Paraná: Hatschbach 12952 (Eu--662).

LIPPIA BAUMII Gürke

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 481. 1978; Mold., Phytol. Mem. 2: 227, 231, 233, 243, & 559. 1980.

LIPPIA BELLATULA Mold.

Additional bibliography: Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 481. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Harley and his associates describe this plant as a subshrub, 1 m. tall, with many straight branches spreading from the base, the leaves dull-green and aromatic, the corollas "pink with a yellow throat", and have encountered it among sandstone rocks on dry hillsides with scrubby vegetation, at 1200 m. altitude, flowering in March.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19943* (Id, N).

LIPPIA BOCAINENSIS Glaz.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 39 (2): 320. 1913; Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 481--482. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA BOLIVIANA Rusby

Additional bibliography: Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 482 (1978) and 42: 199. 1979; Mold., *Phytol. Mem.* 2: 134, 147, 175, 188, & 559. 1980.

Recent collectors describe this plant as 1--1.6 m. tall, and have found it growing at 2480--2590 m. altitude, flowering in March and October. The corollas are said to have been "white" on *Beck 882* and *Jiménez 185*.

Additional citations: BOLIVIA: Cochabamba: *S. G. Beck 882* (Id); *A. M. Jiménez 185* (Id).

LIPPIA BOLIVIANA var. *ANGUSTA* Mold.

Additional bibliography: Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 482. 1978; Mold., *Phytol. Mem.* 2: 175 & 559. 1980.

LIPPIA BOLIVIANA var. *INTEGRIFOLIA* Mold., *Phytologia* 42: 199. 1979.

Bibliography: Mold., *Phytologia* 42: 199. 1979; Mold., *Phytol. Mem.* 2: 175 & 559. 1980.

Citations: BOLIVIA: Cochabamba: *A. M. Jimenez 188* (Z--type).

LIPPIA BOTHRIOURA Briq.

Additional bibliography: Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 482. 1978; Mold., *Phytol. Mem.* 2: 177, 180, & 559. 1980.

LIPPIA BRACTEATA Carr.

Additional bibliography: Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 482. 1978; Mold., *Phytol. Mem.* 2: 357 & 559. 1980.

LIPPIA BRACTEOSA (Mart. & Gal.) Mold.

Additional bibliography: Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 39: 435. 1978; Hocking, *Excerpt. Bot. A.33*: 87. 1979; Mold., *Phytol. Mem.* 2: 64 & 559. 1980.

LIPPIA BRADEANA Mold.

Additional bibliography: Mold., Biol. Abstr. 61: 4884. 1976; Mold., Phytologia 39: 24, 39, & 40. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

LIPPIA BRADEANA var. *VELUTINA* Mold.

Additional bibliography: Mold., Biol. Abstr. 61: 4884. 1976; Mold., Phytologia 39: 24 & 40. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

LIPPIA BRADEI Mold.

Additional bibliography: Mold., Phytologia 39: 24. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

Recent collectors describe this plant as a subshrub, to 50 cm. tall, "solo ramoso", with purple corollas. They have encountered it at the base of a morro, at 1050 m. altitude, flowering in July.

Additional citations: BRAZIL: Bahia: *Hatschbach & Guimaraes* 42383 (Z).

LIPPIA BROMLEYANA Mold., Phytologia 43: 294--295. 1979.

Bibliography: Mold., Phytologia 43: 294--295. 1979; Mold., Phytol. Mem. 2: 147 & 559. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley* 19226 (Ld--isotype, N--type, Ub--holotype, Z--isotype).

LIPPIA BURTONII J. G. Baker

Additional bibliography: Mold., Phytologia 39: 25 & 395. 1978; Mold., Phytol. Mem. 2: 220, 227, 236, & 559. 1980.

LIPPIA CAFFRA Sond.

Additional bibliography: Mold., Phytologia 39: 25. 1978; Mold., Phytol. Mem. 2: 246 & 559. 1980.

LIPPIA CALLENSI Mold.

Additional bibliography: Mold., Phytologia 39: 25. 1978; Mold., Phytol. Mem. 2: 220 & 559. 1980.

LIPPIA CALLENSI var. *VILLOSA* Mold.

Additional bibliography: Mold., Phytologia 39: 25. 1978; Mold., Phytol. Mem. 2: 217, 220, & 559. 1980.

LIPPIA CALLICARPAEFOLIA H.B.K.

Emended synonymy: *Lippia callicarpaefolia* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 485. 1821.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 485 (1821) and ed. 2, 2: 54. 1841; Imbesi, Ind. Piante 450. 1964; Mold., Phytologia 39: 435 & 442 (1978) and 40: 69 & 81. 1978; Mold., Phytol. Mem. 2: 64, 72, 357, 419, & 559. 1980.

The vernacular name, "nacca", is reported for this plant. Material of *L. callicarpaefolia* has been misidentified and distrib-

uted in some herbaria as *Lagascea* sp.

Additional citations: GUATEMALA: Amatitlan: Kellerman 6372 (Me--117222).

LIPPIA CAMPESTRIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 28. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA CANDICANS Hayek

Additional bibliography: Mold., *Phytologia* 39: 28. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA CARDIOSTEGIA Benth.

Additional bibliography: Mold., *Phytologia* 39: 435 (1978) and 40: 69. 1978; Mukherjee & Chanda, *Trans. Bose Res. Inst.* 41: 40. 1978; Mold., *Phytol. Mem.* 2: 64, 72, 76, 77, 79, 81, 84, & 559. 1980.

Recent collectors have found this plant growing in cultivated areas on hillsides, in low deciduous forests on broken lava, among loose volcanic cinders of ridgetops, along roadsides, on steep slopes partially covered by disturbed forest, and in areas dominated by grasses and dense shrubs to 1 m. tall, describing it as a common shrub, 1--2.5 m. tall. They have encountered it at 375--1330 m. altitude, flowering in November, and in fruit in July and November. The corollas are said to have been "white with a yellow center" on *Stevens* 3919 & 4507.

Additional citations: GUATEMALA: Santa Rosa: Dunn, *Dziekanowski*, & Pennell 23016 (N). NICARAGUA: Granada: F. B. Nelson 7510 (Au). Managua: W. D. Stevens 3919 (Z), 4507 (Id), 5277 (Id).

LIPPIA CARVIODORA Meikle

Additional bibliography: Mold., *Phytologia* 39: 30--31. 1978; Mold., *Phytol. Mem.* 2: 231 & 559. 1980; W. T. W. Morgan, *Econ. Bot.* 35: 124. 1981.

Morgan (1981) cites *Mathew* 6510 and records the vernacular name, "esrilipong", from Kenya for this species.

LIPPIA CARVIODORA var. *MINOR* Meikle

Additional bibliography: Mold., *Phytologia* 39: 31. 1978; Mold., *Phytol. Mem.* 2: 204, 231, & 559. 1980

LIPPIA CENTAUREA A. Chev.

Additional bibliography: Mold., *Phytologia* 39: 31. 1978; Mold., *Phytol. Mem.* 2: 217 & 559. 1980.

LIPPIA CHEVALIERII Mold.

Additional bibliography: Mold., *Phytologia* 39: 31--32, 181, & 456. 1978; Mold., *Phytol. Mem.* 2: 200, 205--208, 213, & 559. 1980.

LIPPIA CHIAPASENSIS Loes.

Additional bibliography: Mold., *Phytologia* 41: 133--134. 1978; Mold., *Phytol. Mem.* 2: 64, 72, & 559. 1980.

Recent collectors have found this plant in flower in December.

Additional citations: MEXICO: Chiapas: *Miranda* 5824 (Me--71052).

LIPPIA CHRYSANTHA Greenm.

Additional bibliography: Mold., *Phytologia* 39: 33. 1978; Mold., *Phytol. Mem.* 2: 64 & 559. 1980.

Recent collectors have found this plant in anthesis in January.

The *Lundell & Lundell* 12507, distributed as and previously cited by me as *L. chrysantha*, actually is *L. oaxacana* Robinson & Greenm.

Additional citations: MEXICO: Chiapas: *Miranda* 5982 (Me--71815), 5995 (Me--71811).

LIPPIA CIPOËNSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 33. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA CONTERMINA Briq.

Additional bibliography: Griseb., *Abhandl. K. Gesell. Wiss. Gött.* 24: [Symb. Fl. Argent.] 277. 1879; Mold., *Phytologia* 39: 33. 1978; Mold., *Phytol. Mem.* 2: 178, 188, & 559. 1980.

Grisebach (1879) says for his *L. turnerifolia* var. *camporum*: "Huc referenda videtur *Lantana brasiliensis* Lk. ex Ic. Schauer in Fl. bras. IX. t. 43., *Sarcolippia* Cham., ab auctore ipso *Lippii* adnumerata, sed nostra suffrutescens, non fruticosa".

LIPPIA CONTROVERSA Mold.

Additional bibliography: Mold., *Phytologia* 39: 436 (1978) and 40: 82. 1978; Mold., *Phytol. Mem.* 2: 64, 72, 76, 79, 81, & 559. 1980.

Recent collectors describe this plant as an open-crowned aromatic shrub or shrub-like tree, 1.2--3 m. tall, the foliage with a lemon scent, and have found it growing in drainage ditches in pastures, along roadsides, in weedy fields and roadside ditches, in tropical dry forests, in "areas of open lava flows and closed forest", and in highly mixed tropical forests dominated by pine and oak on mountain slopes with clay soils volcanically derived, as well as scattered in short-tree forests with dense undergrowth, at 40--3100 m. altitude, in flower from May to July and September, in fruit in May and June. Neil refers to it as an "uncommon shrub", while Stevens found it to be "common on floodplains". The corollas are said to have been "yellow" on *Boutin & Brandt* 2346 and *Fryxell & Lott* 3243, "at first white with a yellow center, later entirely white" on *Stevens* 3533, and "white with a yellow center" on *Neill* 4303 and *Stevens* 2885 & 3018.

Additional citations: MEXICO: Chiapas: *Fryxell & Lott* 3243 (Z). Jalisco: *Boutin & Brandt* 2346 (Me--214975). Nayarit: *Gentry & Gilly* 10484 (Me--48955). Oaxaca: *Miranda* 4705 (Me--71051). NICARAGUA: Managua: *Neill* 2296 (Ld); W. D. *Stevens* 2885 (Ld), 3533 (Ld). Masaya: *Neill* 4303 (Ld). Nuevo Segovia: W. D. *Stevens* 3018 (Ld).

LIPPIA CONTROVERSA var. *BREVIPELUNCULATA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 34. 1978; Mold., *Phytol. Mem.* 2: 64, 79, & 559. 1980.

Recent collectors describe this plant as an abundant aromatic shrub, 2--3 m. tall, and have found it to be "common near crater rim" and in gallery forests and dense secondary growth on level plains, at 80--100 m. altitude. The corollas are said to have been "white" on *Stevens* 3370.

Additional citations: NICARAGUA: Managua: *W. D. Stevens* 3370 (Ld), 3409 (Ld).

LIPPIA CORIACEA Briq.

Additional bibliography: Mold., *Phytologia* 39: 34. 1978; Mold., *Phytol. Mem.* 2: 178 & 559. 1980.

LIPPIA CORYMBOSA Cham.

Additional bibliography: Mold., *Phytologia* 39: 436. 1978; Mold., *Phytol. Mem.* 2: 147, 419, & 559. 1980.

Recent collectors describe this species as a subshrub, growing from woody underground parts, to 60 cm. tall, with purple bracts, and have encountered it as "rare" in the drier places on flat sandy ledges among boulders, on rocky hillsides and steep slopes, at 1600 m. altitude, flowering in February. The flowers are described as "corolla-tube purple with a white center" on *Gates & Estabrook* 138.

Additional citations: BRAZIL: Goiás: *Gates & Estabrook* 138 (N). Minas Gerais: *Irwin, Fonseca, Souza, Reis dos Santos, & Ramos* 27508 (N).

LIPPIA COSTARICENSIS Mold.

Additional synonymy: *Lippia costariensis* Mukherjee & Chanda, *Trans. Bose Res. Inst.* 41: 40, sphalm. 1978.

Additional bibliography: Mold., *Phytologia* 41: 134. 1978; Mukherjee & Chanda, *Trans. Bose Res. Inst.* 41: 40. 1978; Mold., *Phytol. Mem.* 2: 81, 84, 419, & 559. 1980.

LIPPIA CULMENICOLA Mold.

Additional bibliography: Mold., *Phytologia* 39: 36. 1978; Mold., *Phytol. Mem.* 2: 64 & 559. 1980.

Miranda has found this plant in anthesis in December.

Additional citations: MEXICO: Puebla: *Miranda* 2527 (Me---69656).

LIPPIA CURTISIANA Mold.

Additional bibliography: Mold., *Phytologia* 41: 134 & 147. 1978; Mold., *Phytol. Mem.* 2: 64, 72, & 559. 1980.

LIPPIA DAUENSIS (Chiov.) Chiov.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 41: 387. 1918; Mold., *Phytologia* 39: 36--37. 1978; Mold., *Phytol. Mem.* 2: 203, 204, 231, 420, & 559. 1980.

Ash describes this plant as a bushy herb, to 3 feet tall, with dark-green leaves, and found it to be colonizing areas of dried

red mud-flats around ponds, at 1480 m. altitude, along with *Acacia nilotica* and *Chrysanthellum americanum* in the fringing layer. The corollas are said to have been "white" on Ash 2813.

Additional citations: ETHIOPIA: Ash 2813 (W--2819810).

LIPPIA DIAMANTINENSIS Glaz.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; Mold., Phytologia 39: 37. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

LIPPIA DOMINGENSIS Mold.

Additional bibliography: Mold., Phytologia 39: 37. 1978; Mold., Phytol. Mem. 2: 95 & 559. 1980.

LIPPIA DUARTEI Mold.

Additional bibliography: Mold., Phytologia 39: 37. 1978; Mold., Phytol. Mem. 2: 147 & 559. 1980.

LIPPIA DUMETORUM Herzog

Additional bibliography: Mold., Phytologia 39: 37--38 & 264. 1978; Mold., Phytol. Mem. 2: 175 & 559. 1980.

Recent collectors describe this species as a very fragrant shrub, 2 m. tall, and have encountered it at 170 m. altitude, flowering in April. The corollas are said to have been "white" on Krapovickas & Schinini 36286.

Additional citations: BOLIVIA: Santa Cruz: Krapovickas & Schinini 36286 (Z).

LIPPIA DURANGENSIS Mold.

Additional bibliography: Mold., Phytologia 39: 38. 1978; Mold., Phytol. Mem. 2: 64 & 559. 1980.

LIPPIA EKMANI Mold.

Additional bibliography: Mold., Phytologia 39: 38--39. 1978; Mold., Phytol. Mem. 2: 147, 188, & 559. 1980.

LIPPIA ELEGANS Cham.

Synonymy: *Lippia elegans* Cham. ex Mold., Phytol. Mem. 2: 420, in syn. 1980.

Additional bibliography: Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 602. 1927; Mold., Phytologia 39: 436 (1978) and 40: 65. 1978; Mold., Phytol. Mem. 2: 147, 420, & 559. 1980.

Recent collectors refer to this plant as a very common fragrant shrub, 0.8--1.5 m. tall, found on campo and in caatinga, at 500 m. altitude, flowering and fruiting in March. The corollas are described as having been "white, center of tube yellow" on Mori & al. 9532, and "white" on Hatschbach 42096 & Krapovickas & Cristóbal 35376.

Material of *L. elegans* has been misidentified and distributed in some herbaria as *Lantana* sp.

Additional citations: BRAZIL: Bahia: Hatschbach 42096 (N); Mori,

Mattos Silva, Santos, Kallunki, & Pennington 9532 (Ld, N). Mato Grosso: Hatschbach 34152 (W--2839445). Minas Gerais: Irwin, Fonseca, Souza, Reis dos Santos, & Ramos 27193 (N); Krapovickas & Cristóbal 35376 (Z).

LIPPIA ELEGANS var. *OBTUSIFOLIA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 39. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA ELLIPTICA Schau.

Additional bibliography: Mold., *Phytologia* 39: 436. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 190. 1980.

LIPPIA ELLIPTICA var. *SILVICOLA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 436. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 190. 1980.

Recent collectors describe this plant as a shrub, 2 m. tall, the corollas "yellow in the center", and found it growing in the transition zone between mata de cipó and caatinga much disturbed by domestic animals, flowering in April.

Additional citations: BRAZIL: Bahia: Mori, Mattos Silva, Kallunki, & Santos 9994 (Ld, N).

LIPPIA EUPATORIUM Schau.

Additional bibliography: Mold., *Phytologia* 39: 24, 37, & 39--41. 1978; Mold., *Biol. Abstr.* 67: 708. 1979; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

Hatschbach describes this plant as erect, with yellow flowers [corollas], and encountered it on rocky campo, flowering in May. Additional citations: BRAZIL: Distrito Federal: Hatschbach 36696 (Eu--34807).

LIPPIA EUPATORIUM var. *ANGUSTIFOLIA* Mold.

Synonymy: *Lippia eupatorium* var. *angustifolium* Mold., *Phytol. Mem.* 2: 559, sphalm. 1980.

Additional bibliography: Mold., *Phytologia* 39: 40--41. 1978; Mold., *Phytol. Mem.* 2: 147 & 559. 1980.

LIPPIA FELIPPEI Mold.

Additional bibliography: Mold., *Phytologia* 39: 41. 1978; Mold., *Phytol. Mem.* 2: 147 & 560. 1980.

LIPPIA FERRUGINEA H.B.K.

Emended synonymy: *Lippia ferruginea* Humb. & Bonpl. apud Steud., *Nom. Bot. Phan.*, ed. 1, 485. 1821.

Additional bibliography: Steud., *Nom. Bot. Phan.*, ed. 1, 485 (1821) and ed. 2, 2: 54. 1841; Mold., *Phytologia* 39: 41 & 167. 1978; Mold., *Phytol. Mem.* 2: 134 & 560. 1980.

LIPPIA FILIFOLIA Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 39: 41--42. 1978; Mold., *Phytol. Mem.* 2: 147 & 560. 1980.

LIPPIA FLAVIDA Urb.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 40 (2): 335. 1915; Mold., *Phytologia* 39: 42. 1978; Mold., *Phytol. Mem.* 2: 95 & 560. 1980.

LIPPIA FLORIDA Cham.

Additional bibliography: Mold., *Phytologia* 39: 42 & 444. 1978; Mold., *Phytol. Mem.* 2: 147 & 560. 1980.

LIPPIA FORMOSA T. S. Brandeg.

Additional bibliography: Mold., *Phytologia* 39: 42--43. 1978; Mold., *Phytol. Mem.* 2: 64 & 560. 1980; Wiggins, *Fl. Baja Calif.* 33 & 530. 1980.

LIPPIA FRAGRANS Turcz.

Additional & emended bibliography: D. H. Scott in Solered., *Syst. Anat. Dicot.* [transl. Boodle & Fritsch] 2: 1020 & 1021. 1908; Reiche & Phil. in Reiche, *Estud. Crit. Fl. Chile* 5: 298 & 299. 1910; Mold., *Phytologia* 39: 43. 1978; Mold., *Phytol. Mem.* 2: 183 & 560. 1980.

Reiche & Philippi (1910) describe this species as "Planta perenne, algo leñosa en la base, muy olorosa por las muchas glándulas que la cubren. Tallos estriados, ramosos. Hojas opuestas, enteras, oblongas, atenuadas en la base, generalmente agudas; de 1--2,5 cm. de largo, sus bordes provistos de pelos blancos. Inflorescencia paniculada, compuesta de glomerulos subglobosos. Brácteas anchamente aovadas, en la cara exterior i en los bordes largamente peludas; las inferiores de 3--4 mm. Cáliz bipartido, largamente peludo, de 3,5--4 mm.. Corola blanca; su tubo \pm del largo de cáliz; el limbo marcadamente cigomorfo por la estension mayor de uno de los 5 lóbulos obtusos. Estambres 4, didinamos, con las anteras casi sésiles; las de insercion superior cada una con un apéndice largo del conectivo. Estigma oblicuo, dilatado. El ovario fácilmente se deshace en 2 porciones con un óvulo en cada una. Fruto desconocido. Tallos hasta 0,6 m. -- Planta muy caracterfstica de la seccion *Zapania*. Provincia de Atacama (Bandurrias)."

LIPPIA FRANCENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 43, 80, & 170. 1978; Mold., *Phytol. Mem.* 2: 147, 420, & 560. 1980.

LIPPIA GARDNERIANA Schau.

Additional bibliography: Mold., *Phytologia* 39: 35, 43--44, 164. & 440. 1978; Mold., *Phytol. Mem.* 2: 147 & 560. 1980.

LIPPIA GEHRTII Mold.

Additional bibliography: Mold., *Phytologia* 39: 44. 1978; Mold.,

Phytol. Mem. 2: 147, 420, & 560. 1980.

LIPPIA GENTRYI Standl.

Additional bibliography: Mold., Phytologia 39: 44--45 & 442. 1978; Mold., Phytol. Mem. 2: 64 & 560. 1980.

LIPPIA GLANDULOSA Schau.

Additional bibliography: Mold., Phytologia 41: 134 & 151. 1978; Mold., Phytol. Mem. 2: 147 & 560. 1980.

Recent collectors refer to this plant as a shrub, 0.6--2 m. tall, and found it growing in caatinga and on granite cliffs, at 300--900 m. altitude, flowering and fruiting from February to April. The corollas are said to have been "white" on Mori 13431 and Mori & al. 9960. Rosa & Cordeiro comment: "Inflorescencia seca, cheiro ativo agradavel".

Material of this species has been misidentified and distributed in some herbaria as *Hyptis goyazensis*.

Additional citations: BRAZIL: Bahia: *Döbereiner-Tokarnia 1449* (Id); Mori 13431 (N, Z); Mori, Mattos Silva, Kallunki, & Santos 9960 (N, Z). Roraima: Rosa & Cordeiro 1507 (N).

LIPPIA GLAZIOVIANA Loes.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 39 (2): 320. 1913; Mold., Phytologia 39: 45--46 & 445. 1978; Mold., Phytol. Mem. 2: 147 & 560. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Recent collectors describe this plant as a woody shrub to 40 cm. tall and report it to be "common" in sandy soil of rocky campo among boulders, at 1600 m. altitude, in flower in February. Gates & Estabrook describe the corollas on their no. 102 as "corolla-tube purple with white hairs outside and in throat, center of tube yellow with white ring at color change from purple, becoming darker purple with orange throat in age".

Additional citations: BRAZIL: Goiás: Gates & Estabrook 102 (N).

LIPPIA GOSSWEILERI S. Moore

Additional & emended bibliography: Good & Exell, Journ. Bot. 68: Suppl. 2: 139. 1930; Mold., Phytologia 39: 46. 1978; Mold., Phytol. Mem. 2: 233 & 560. 1980.

LIPPIA GRACILIS Schau. in A. DC., Prodr. 11: 576--577. 1847 [not *L. gracilis* R. A. Phil., 1896].

Additional bibliography: Mold., Phytologia 39: 45, 46, 78, 179, & 438. 1978; Hocking, Excerpt. Bot. A.33: 87. 1979; Mold., Phytol. Mem. 2: 147, 357, & 560. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 190. 1980.

Recent collectors describe this plant as a dense aromatic shrub, 1.5--1.8 m. tall, and have found it growing in caatinga, flowering in January, April, and May, in fruit in January. The corollas are said to have been "white" on Cavalcante & Silva 2629 and Matos 8474.

The homonymous *L. gracilis* R. A. Phil. is a synonym of *Acantholippia trifida* var. *reichei* Mold.

Material of *L. gracilis* Schau. has been misidentified and distributed in some herbaria as *Hyptis suaveolens* Poir.

Additional citations: BRAZIL: Ceará: Matos 8474 (N). Espírito Santo: W. Hoehne 5549 (W--2860001). Pará: Cavalcante & Silva 2629 (N); Rosa & Santos 1885 (N).

LIPPIA GRANDIFLORA Mart. & Schau.

Additional bibliography: Mold., Phytologia 39: 78--80, 165, & 440. 1978; Mold., Phytol. Mem. 2: 148, 405, & 560. 1980.

LIPPIA GRANDIFOLIA Hochst.

Additional bibliography: Mold., Phytologia 39: 80--81. 1978; Mold., Phytol. Mem. 2: 201, 203, 220, 222, 224, 231, 420, & 560. 1980.

LIPPIA GRANDIFOLIA var. *ANGUSTISPICATA* Mold.

Additional bibliography: Mold., Phytologia 39: 81. 1978; Mold., Phytol. Mem. 2: 220 & 560. 1980.

LIPPIA GRANDIFOLIA var. *LONGIPEDUNCULATA* Mold.

Additional bibliography: Mold., Phytologia 39: 81. 1978; Mold., Phytol. Mem. 2: 220, 224, & 560. 1980.

LIPPIA GRATA Schau.

Additional bibliography: Mold., Phytologia 39: 81--82 & 455. 1978; Mold., Phytol. Mem. 2: 148 & 560. 1980.

Mori describes this plant as a shrub, 3 m. tall, the corollas "white, with a yellow spot in the center". He encountered it in caatinga, at 350 m. altitude, flowering in March.

Additional citations: BRAZIL: Bahia: Mori 13447 (N, Z).

LIPPIA GRAVEOLENS H.B.K.

Additional & emended synonymy: *Lippia graveolens* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 486. 1821. *Lippia berlandii* Brouk, Pl. Consum. Man, 316, sphalm. 1975. *Lippia graviolens* H.B.K., in herb.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 486 (1821) and ed. 2, 2: 54. 1841; D. Dietr., Syn. Pl. 3: 599. 1841; Imbesi, Ind. Piante 450. 1964; Brouk, Pl. Consum. Man. 316 & 470. 1975; Terrell, U. S. Dept. Agr. Agric. Handb. 505: 71 & 166. 1977; Mold., Phytologia 41: 134. 1978; Mold., Phytol. Mem. 2: 49, 54, 64, 69, 72, 76, 79, 81, 357, 409, 416, 419, & 560. 1980.

Recent collectors refer to this species as a shrub, 0.5--3 m. tall, growing from a woody rootstock, the leaves aromatic, and have found it to be "frequent in matorral of *Prosopis glandulosa* and *Acacia rigidula*", among boulders on cliffs, in sandy-clay soil, in matorral with woody shrubs and *Hechtia glomerata*, in woods of *Acacia*, *Quercus*, *Garrya*, *Juniperus*, etc., on limestone hills, on steep slopes with *Quercus*, *Juniperus*, *Bursera*, *Ipomoea* and *Helio-carpus*, and "scattered with *Prosopis*, *Larrea*, *Viguiera stenoloba*,

and *Fouquiera*", at 52--2200 m. altitude, in anthesis in March, August, September, and November. They report the vernacular name, "orégano cimarrón".

Pennell and his associates encountered the plant "on steep hillslopes with much caliche outcrop, very alkaline, with arid scrub, giant barrel cacti and euphorbs of many genera". Cochran and his associates describe it as "frequent twiggy shrubs to 10.5 dm. tall, several-stemmed at base, soon branching, the whole plant aromatic, flowers fragrant, corolla white with a small yellow eye; cytological material collected" but apparently distributed as *Lantana velutina* Mart. & Gal. by misidentification. They encountered the plant "on low gravelly hills and river valley, in grazed desert to open crassicaulis matorral dominated by *Cephalocereus hoppenstedtii* and spiny mimosoid legumes, with *Yucca verniculosa*, *Beaucarnea gracilis*, *Actinocheita filicina*, *Juliana adstringens*, *Jatropha neopauciflora*, *Malpighia galeottiana*, and *Echinopteris lappula*", at 1600 m. altitude, flowering in July.

The corollas are said to have been "white" on *Breedlove* 35907, *Crutchfield* 1108 & 1143, and *Webster, Miller, & Miller* 12909, "cream-white" on *Correll* 31565, and "very pale-yellow" on *Smith & Corona Mex.* 36.

Terrell (1977) asserts that the "oregano" of commerce comes only in part from *Lippia graveolens* and in part from *Origanum vulgare* L.

Material of *Lippia graveolens* has been misidentified and distributed in some herbaria as "*Alloysia gratissima* (Gill. & Hook.) Troncoso", *Lantana velutina* Mart. & Gal., and even as *Turnera diffusa* Willd. On the other hand, the *Medrano* 10060, distributed as *Lippia graveolens*, actually is *Lantana microcephala* A. Rich.

Additional citations: TEXAS: Brewster Co.: *D. S. Correll* 31565 (N). Cameron Co.: *Cantu* 83 (Ne--94040); *Crutchfield* 1108 (N). Hidalgo Co.: *Barrera s.n.* [13 June 1979] (Ne--173704). Starr Co.: *Crutchfield* 1143 (N). MEXICO: Chiapas: *Webster, Miller, & Miller* 12909 (Me--133595). Coahuila: *Butterwick, Smith, & Whalen* 582 (Au). Guerrero: *Breedlove* 35990 (N). Morelos: *Miranda* 1621 (Me--73558); *Vázquez* 3949 (Me--168847). Nuevo León: *Socorro Gonzalez s.n.* (Au). Oaxaca: *Breedlove* 35907 (N); *Miranda* 4739 (Me--71050). Puebla: *Cochrane, Cochran, & al.* 8506 (Ld); *Pennell, Dunn, & Dziekanowski* 192 (N). San Luis Potosí: *Marioquin s.n.* [4-III-61] (Me--73523). Veracruz: *Smith & Corona Mex.* 36 (Me--99384).

LIPPIA GRISEA Mold.

Additional bibliography: Mold., *Phytologia* 39: 88--89. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980.

LIPPIA GRISEBACHIANA Mold.

Additional & emended bibliography: Sanzin, *Anal. Soc. Cient. Argent.* 88: 98, 100, 102, 103, & 133, fig. 5. 1919; Mold., *Phytologia* 39: 89 (1978) and 40: 76. 1978; Mold., *Phytol. Mem.* 2: 188 & 560. 1980.

Emended illustrations: Sanzin, *Anal. Soc. Cient. Argent.* 88: 103, fig. 5. 1919.

LIPPIA HARLEYI Mold.

Additional bibliography: Mold., *Phytologia* 39: 436--437. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 190. 1980.

LIPPIA HASSLERIANA Chod.

Additional bibliography: Mold., *Phytologia* 39: 89. 1978; Mold., *Phytol. Mem.* 2: 148, 178, & 560. 1980.

Pedersen found this plant growing in rough grassland, flowering in December. The corollas are said to have been "white" on his no. 9520.

Additional citations: PARAGUAY: *Pedersen* 9520 (W--2883249).

LIPPIA HATSCHBACHII Mold.

Additional bibliography: Mold., *Phytologia* 41: 134. 1978; Mold., *Phytol. Mem.* 2: 148, 420, & 560. 1980.

LIPPIA HEDERAFFOLIA Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 41: 134--135. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980.

Additional citations: BRAZIL: Minas Gerais: *Hatschbach* 41418 (W--2840080); *Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos* 27267 (N), 28442 (N).

LIPPIA HERBACEA Mart.

Additional bibliography: Mold., *Phytologia* 39: 90. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980.

Recent collectors describe this plant as an herb, 1 m. tall, viscous near the inflorescence, the phyllaries violet, and the flower-heads pale-lavender, and have found it growing on rocky campo and in low woods, at 1000 m. altitude.

Additional citations: BRAZIL: Goiás: *Irwin, Reis dos Santos, Souza, & Fonsêca* 24455 (N). Minas Gerais: *Hatschbach & Ramamoorthy* 38008 (W--2839397).

LIPPIA HIERACIFOLIA Cham.

Additional bibliography: Mold., *Phytologia* 39: 90--91. 1978; Mold., *Phytol. Mem.* 2: 148, 180, 188, & 560. 1980.

LIPPIA HIRSUTA L. f.

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 602. 1927; Mold., *Phytologia* 41: 135. 1978; Steyererm. & Huber, *Fl. Avila* 862 & 868. 1978; Hocking, *Excerpt. Bot. A.* 33: 91. 1979; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytol. Mem.* 2: 109, 422, & 560. 1980.

Knuth (1927) cites *Hartweg* 1354 as from Venezuela even though its accompanying label is inscribed "Columbia", Venezuela having been a part of Colombia then. He lists the vernacular name, "amogre".

LIPPIA HIRSUTA var. *MORITZII* (Turcz.) López-Palacios

Additional & emended bibliography: Knuth, *Feddes Repert. Spec.*

Nov. Beih. 43: [Init. Fl. Venez.] 602 & 603. 1927; H. N. & A. L. Mold., Pl. Life 2: 51, 73, & 81. 1948; Mold., Phytologia 41: 135. 1978; Steyerl. & Huber, Fl. Avila 862 & 868. 1978; Hocking, Excerpt. Bot. A.33: 91. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytol. Mem. 2: 109, 116, 419--422, & 560. 1980.

Recent collectors describe this plant as a treelet, 4--5 m. tall, with a globose crown, the flowers attracting a large number of insects. They have found it in flower in August. The corollas are said to have been "cream" color on *Aristeguieta* 3350.

Knuth (1927) cites *Wagener* 426 from Federal District and *Moritz* 1640 from Miranda, Venezuela.

Additional citations: VENEZUELA: Mérida: *Bernardi* s.n. [10 Mayo 1956] (N). Trujillo: *Aristeguieta* 3350 (W--2882578).

LIPPIA HIRTA (Cham.) Meisn.

Additional bibliography: Mold., Phytologia 39: 95--96. 1978; Mold., Phytol. Mem. 2: 148 & 560. 1980.

Hatschbach notes that this plant grows from a xylopodium, is to 70 cm. tall, and encountered it on dry campo. flowering in February. The corollas on his *no.* 41449 are said to have been "lilac" in color when fresh.

Additional citations: BRAZIL: Paraná: *Hatschbach* 41449 (Id).

LIPPIA HISPIDA Good in Good & Exell, Journ. Bot. 68: Suppl. 2: 139--140. 1930.

Additional & emended bibliography: Good & Exell, Journ. Bot. 68: Suppl. 2: 139--140. 1930; Mold., Phytologia 39: 96. 1978; Mold., Phytol. Mem. 2: 233, 246, & 560. 1980.

Recent collectors have encountered this plant at 800--1000 m. altitude, in both anthesis and fruit in December. Material has been misidentified and distributed in some herbaria as *L. javanica* (Burm. f.) Spreng.

Additional citations: SOUTH AFRICA: Transvaal: *Dahlstrand* 181 (Go), 1299 (Go).

LIPPIA HOEHNEI Mold.

Additional bibliography: Mold., Phytologia 41: 145. 1979; Mold., Phytol. Mem. 2: 148 & 560. 1980.

Additional citations: BRAZIL: Mato Grosso: (W--2839442).

LIPPIA HOEHNEI var. *GOYAZENSIS* Mold.

Additional bibliography: Mold., Phytologia 39: 97. 1978; Mold., Phytol. Mem. 2: 148. 1980.

LIPPIA INDICA Mold.

Additional bibliography: Mold., Phytologia 40: 200--201. 1978; Hocking, Excerpt. Bot. A.33: 88. 1979; Mold., Phytol. Mem. 2: 263, 419, 422, & 560. 1980.

LIPPIA INOPINATA Mold.

Additional bibliography: Mold., *Phytologia* 39: 97. 1978; Mold., *Phytol. Mem.* 2: 64 & 560. 1980.

Recent collectors have encountered this plant in pastizal chaparral, flowering and fruiting in November, also in anthesis in December.

Additional citations: MEXICO: Aguascalientes: *Meza, Soto, & León* 493 (Me--119426). Chiapas: *Miranda* 9123 (Me--71816).

LIPPIA INSIGNIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 97. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

Harley and his associates describe this species as a slender, aromatic subshrub, 1 m. tall, the stems brittle, little-branched, the leaves rather rigid, scabrid, glossy, dark-green above, gray-green beneath, the corolla "bright-pink, whitish in [the] throat," and have encountered it among sandstone rocks with open sand in the flatter areas and with open scrub in exposed sites to scattered woodland, at 1000 m. altitude, flowering and fruiting in March.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley* 19360

LIPPIA INTEGRIFOLIA (Griseb.) Hieron.

Additional bibliography: Griseb., *Abhandl. K. Gesell. Wiss. Gött.* 24: [Symb. Fl. Argent.] 278. 1879; Mold., *Phytologia* 39: 98 (1987) and 40: 76. 1978; Mold., *Phytol. Mem.* 2: 189 & 560. 1980.

LIPPIA INTERMEDIA Cham.

Additional bibliography: Hocking, *Excerpt. Bot. A.25*: 379. 1975; Mold., *Phytologia* 39: 98--99. 1978; Troncoso in *Burkart, Fl. Ilustr. Entre Rios* 5: 280. 1979; Mold., *Phytol. Mem.* 2: 148, 178, 189, & 560. 1980.

Hatschbach describes this plant as xylopodiferous, with yellow "flowers" [corollas], and found it growing in dry campo, flowering in September.

Troncoso (1979) avers that the *L. intermedia* Cham. of Grisebach (1879) is actually *L. arechavaletae* Mold. and that the true *L. intermedia* of Chamisso is limited to "Brasil meridional" and Paraguay.

Additional citations: BRAZIL: Paraná: *Hatschbach* 17091 (Eu--5476).

LIPPIA INTERMEDIA var. *PARVIFOLIA* Mold.

Additional bibliography: Hocking, *Excerpt. Bot. A.25*: 379. 1975; Mold., *Phytologia* 39: 99. 1978; Mold., *Phytol. Mem.* 2: 148 & 560. 1980.

LIPPIA IODOPHYLLA Schau.

Additional bibliography: Mold., *Phytologia* 39: 99. 1978; Mold.,

Phytol. Mem. 2: 148 & 560. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 191. 1980.

Harley and his associates describe this plant as a brittle-stemmed shrublet, to 75 cm. tall, the leaves bright-green, glossy above, pale beneath, slightly aromatic, the bracts pale-green, and the corollas "deep-lilac with [an] orange-yellow throat surrounded by white", and have found it growing by a small river in a flooded restinga forest, at sealevel, flowering in January.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 18239 (Ld, N).

LIPPIA JALISCANA Mold.

Additional bibliography: Mold., Phytologia 39: 99. 1978; Mold., Phytol. Mem. 2: 64 & 560. 1980.

LIPPIA JANGADENSIS S. Moore

Additional bibliography: Mold., Phytologia 39: 99. 1978; Mold., Phytol. Mem. 2: 148 & 560. 1980.

LIPPIA JANGADENSIS var. *EITENORUM* Mold.

Additional bibliography: Mold., Phytologia 39: 99. 1978; Mold., Phytol. Mem. 2: 148 & 560. 1980.

LIPPIA JAVANICA (Burm. f.) Spreng.

Additional & emended bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. [Illustr. Gen.] 1: 59 & 60, pl. 17, fig. 2. 1791; Steud., Nom. Bot. Phan., ed. 1, 111. 1821; D. Dietr., Syn. Pl. 3: 596, 599, & 609. 1843; Dithens, Afric. Handb. 8: [Drug Pl. Afr.] 94. 1949; Mold., Phytologia 39: 437, 439, & 447 (1978) and 40: 60 & 80. 1978; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 217. 1979; Mold., Phytol. Mem. 2: 203, 220, 224, 227, 229, 231, 236, 238, 239, 241, 243, 244, 246, 357, 420, 452, & 560. 1980.

Recent collectors describe this plant as an aromatic spreading shrub, to 4 feet tall, and have found it growing in roadside scrub and in deep rich soil along streams, at 600 m. altitude. The corollas were "white" on Bayliss BS.8742.

Dithens (1949) reports this plant is used in Africa to treat colds, dysentery, and malaria.

The Dahlstrand 181 & 1299, distributed as *L. javanica*, actually are *L. hispida* Good, while Dahlstrand 442 & 1133 are *L. scaberrima* Send. and Dahlstrand 58 is *L. whytei* Mold.

Additional citations: SOUTH AFRICA: Cape Province: Bayliss BS. 8742 (N); Collector undetermined s.n. [Mo. Bot. Gard. photos A.865] (Go photo). Transvaal: Dahlstrand 182 (Go), 183 (Go), 688 (Go).

LIPPIA JUNELLIANA (Mold.) Troncoso

Additional bibliography: Mold., Phytologia 39: 106. 1978; Mold., Phytol. Mem. 2: 189 & 560. 1980.

LIPPIA KITUIENSIS Vatke

Additional bibliography: Mold., Phytologia 39: 106 (1978) and

40: 80. 1978; Hocking, Excerpt. Bot. A.33: 87. 1979; Mold., Phytol. Mem. 2: 220, 231, & 560. 1980.

LIPPIA LACUNOSA Mart. & Schau.

Additional bibliography: Hocking, Excerpt. Bot. A.33: 87. 1979; Mold., Phytologia 41: 145. 1979; Mold., Phytol. Mem. 2: 148, 357, & 560. 1980.

Hatschbach describes this plant as a few-branched shrub, 1 m. tall, the corollas "lilac" or "rose" in color, with the interior of the tube yellow, and has found it growing along sandy roadsides and "encosta rochosa de morro", at 1100 m. altitude, in anthesis in September, and in fruit in July.

Additional citations: BRAZIL: Minas Gerais: *Hatschbach 27258* (Eu--18642), 41516 (Ld).

LIPPIA LACUNOSA var. *ACUTIFOLIA* Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 378. 1975; Mold., Phytologia 39: 163. 1978; Mold., Phytol. Mem. 2: 148, 420, & 560. 1980.

LIPPIA LANATA Walp.

Additional bibliography: Mold., Phytologia 39: 163. 1978; Mold., Phytol. Mem. 2: 64 & 560. 1980.

LIPPIA LANTANIFOLIA F. Muell.

Additional bibliography: Mold., Phytologia 39: 163. 1978; Mold., Phytol. Mem. 2: 337 & 560. 1980.

LIPPIA LASIOCALYCINA Cham.

Additional bibliography: Mold., Phytologia 41: 145. 1979; Mold., Phytol. Mem. 2: 148, 175, 178, 416, 420, & 560. 1980.

Recent collectors describe this species as a shrub, 1 m. tall, growing in cerrado, and have found it in flower in September. The corollas are said to have been "purple" on *Argent & al. 6486*.

Additional citations: BRAZIL: Mato Grosso: *Argent, Ramos, Richards, & Souza 6486* (Co, N). Minas Gerais: *Sellow s.n.* [S. Antonio de Monte; Macbride photos 17522] (Z--photo of type).

LIPPIA LASIOCALYCINA var. *SANTHILAIREI* Mold.

Additional bibliography: Mold., Phytologia 39: 164 & 394. 1978; Mold., Phytol. Mem. 2: 148 & 560. 1980.

Recent collectors describe this plant as a shrub, 3 m. tall, and have encountered it in caatinga, at 600 m. altitude, flowering in July. The corollas are said to have been "red" on *Mori & al. 12264*.

Additional citations: BRAZIL: Bahia: *Mori, King, Santos, & Hage 12264* (W--2854260, Z).

LIPPIA LASIOCALYX Herzog

Additional bibliography: Mold., Phytologia 39: 164. 1978; Mold., Phytol. Mem. 2: 175 & 561. 1980.

LIPPIA LAXIBRACTEATA Herzog

Additional bibliography: Mold., *Phytologia* 39: 165. 1978; Mold., *Phytol. Mem.* 2: 148, 175, 189, & 561. 1980.

Recent collectors have found this plant in anthesis in April. The corollas are said to have been "white" on the collection cited below.

Additional citations: BOLIVIA: Santa Cruz: *Krapovickas & Schinini 31316* (Z).

LIPPIA LEPIDA Mold.

Additional bibliography: Mold., *Phytologia* 39: 165. 1978; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

LIPPIA LIBERIENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 165--166 & 266. 1978; Mold., *Phytol. Mem.* 2: 81 & 561. 1980.

LIPPIA LINDMANII Briq.

Additional bibliography: Mold., *Phytologia* 39: 437. 1978; Mold., *Phytol. Mem.* 2: 148, 175, 240, & 561. 1980.

LIPPIA LINDMANII f. *OPPOSITIFOLIA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 437. 1978; Mold., *Phytol. Mem.* 2: 148, 240, & 561. 1980.

LIPPIA LINEARIFOLIA Mold.

Additional bibliography: Mold., *Phytologia* 39: 166. 1978; Mold., *Phytol. Mem.* 2: 148 & 561. 1980

LIPPIA LONGEPEDUNCULATA Kuntze

Additional bibliography: Mold., *Phytologia* 39: 166. 1978; Mold., *Phytol. Mem.* 2: 148, 178, & 561. 1980.

LIPPIA LOPEZII Mold.

Additional bibliography: Mold., *Phytologia* 39: 167. 1978; Mold., *Phytol. Mem.* 2: 134, 421, & 561. 1980.

LIPPIA LORENTZII Mold.

Additional bibliography: Mold., *Phytologia* 39: 167--168. 1978; Mold., *Biol. Abstr.* 67: 708. 1979; Mold., *Phytol. Mem.* 2: 148, 175, 178, 180, 189, 419, 420, & 561. 1980.

Recent collectors refer to this plant as a shrub, 2 m. tall, and have found it in anthesis in October. The corollas are said to have been "violet" in color on the collection cited below.

Additional citations: PARAGUAY: *Schinini & Bordas 17892* (Z).

LIPPIA LUCENS Standl.

Additional bibliography: Mold., *Phytologia* 39: 168 & 266. 1978; Mold., *Phytol. Mem.* 2: 72, 76, & 561. 1980.

LIPPIA LUPULIFORMIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 168. 1978; Mold., *Phytol. Mem.* 2: 227, 231, 233, 246, & 561. 1980.

LIPPIA LUPULINA Cham.

Additional synonymy: *Lippia lupulina* Cham. ex Mold., Phytol. Mem. 2: 421, in syn. 1980.

Additional & emended bibliography: Turcz., Bull. Soc. Nat. Mosc., 36 (2): 204 & 205. 1863; H. N. & A. L. Mold., Pl. Life 2: 53. 1948; Napp-Zinn, Anat. Blatt. A (1): 352 & 724. 1974; Mold., Phytologia 41: 145. 1979; Mold., Phytol. Mem. 2: 148, 175, 178, 189, 420, 421, & 561. 1980.

Recent collectors describe this species as an herb, growing from a xylopodium, the bracts "white, tinted purple", and have found it growing in clay or sandy soil of cerrado, campo cerrado, and campo queimado, flowering in June. The corollas are said to have been "purple" on Prance & al. 26275, "lilac" on Oliveira 66, "rose" on Oliveira 6 & 40, "yellow" on Vieira & al. 948, and "white, interior of corolla yellow" on Vieira & al. 951,

Material of *L. lupulina* has been misidentified and distributed in some herbaria as *Malvaceae* sp.

Additional citations: BRAZIL: Mato Grosso: Oliveira 6 (Ld), 40 (Ld), 66 (Ld); Prance & Schiller 26275 (N). Minas Gerais: Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 27228 (N). Pará: Kirkbride & Lleras 2889 (N). Rondônia: Vieira, Petersen, Nelson, Ramos, & Mota 948 (Ld), 951 (Ld).

LIPPIA LUPULINA var. *ALBIFLORA* Troncoso

Additional bibliography: Mold., Phytologia 39: 171. 1978; Mold., Phytol. Mem. 2: 178 & 561. 1980.

Pedersen describes this plant as a subshrub, 0.3--0.7 m. tall, and found it growing in loose sandy soil of rough grassland.

Additional citations: PARAGUAY: Pedersen 9428 (W--2883280).

LIPPIA LUPULINA var. *PARAGUARIENSIS* Chod.

Additional bibliography: Mold., Phytologia 39: 171--172. 1978; Mold., Phytol. Mem. 2: 148, 178, & 561. 1980.

Recent collectors describe this plant as erect and have encountered it on campo, at 750 m. altitude, flowering in February. The corollas are said to have been "rose"-colored on Hatschbach & al. 35925. Heringer and his associates note that the "inflorescencias nas extremidades dos ramos flores agrupadas protegidas por brácteas rosea com falce amarela".

Additional citations: BRAZIL: Goiás: Heringer, Paula, Mendonça, & Salles 2311 (N). Mato Grosso: Hatschbach, Anderson, Barneby, & Gates 35925 (Eu--33223).

LIPPIA MACEDOII Mold.

Additional bibliography: Mold., Phytologia 39: 172. 1978; Mold., Phytol. Mem. 2: 148 & 561. 1980.

LIPPIA MARRUBIIFOLIA Reichert

Additional bibliography: Mold., Phytologia 39: 172. 1978; Mold., Phytol. Mem. 2: 148 & 561. 1980.

LIPPIA MARTIANA Schau.

Additional bibliography: Mold., *Phytologia* 39: 172 & 263. 1978; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

LIPPIA MARTIANA f. *CAMPESTRIS* Mold., *Phytologia* 41: 346. 1979.

Bibliography: Mold., *Phytologia* 41: 346. 1979; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

Citations: BRAZIL: Distrito Federal: *Tax. Class Univ. Bras.* 518 (N--isotype, W--type).

LIPPIA MATTOGROSSENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 172--173 & 261 (1978) and 40: 65. 1978; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

Recent collectors describe this species as a shrub, 2 m. tall, with fragrant leaves, and have encountered it in typical cerrado vegetation among sandstone rocks, flowering in May. The corollas are said to have been cream-color on the collection cited below.

Additional citations: BRAZIL: Mato Grosso: *Rosa & Santos 1956* (N, N).

LIPPIA MCVAUGHII Mold.

Additional bibliography: Mold., *Phytologia* 39: 173. 1978; Mold., *Phytol. Mem.* 2: 64, 421, & 561.

Itié found this plant in full anthesis and fruit in December.

Additional citations: MEXICO: Chiapas: *Itié 3884* (He--59311).

LIPPIA MELASTOMIFOLIA Gandoger

Additional bibliography: Mold., *Phytologia* 39: 173. 1978; Mold., *Phytol. Mem.* 2: 72 & 561. 1980.

LIPPIA MICHOCANA Mold.

Additional bibliography: Mold., *Phytologia* 39: 174. 1978; Mold., *Phytol. Mem.* 2: 64 & 561. 1980.

LIPPIA MICROCEPHALA Cham.

Additional bibliography: Mold., *Phytologia* 41: 145. 1979; Mold., *Phytol. Mem.* 2: 148, 421, & 561. 1980.

Additional citations: BRAZIL: Minas Gerais: *Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28309* (N).

LIPPIA MICROMERA Schau.

Additional & emended bibliography: Stahl, *Estud. Fl. Puerto Rico*, ed. 1, 3: 292. 1888; Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 602. 1927; Stahl, *Estud. Fl. Puerto Rico*, ed. 2, 3: 292. 1937; H. N. & A. L. Mold., *Pl. Life* 2: 63. 1948; Neal, In *Gard. Hawaii*, ed. 1, imp. 1, 637 & 638, fig. 244b (1948) and ed. 1, imp. 2, 637 & 638, fig. 244b. 1949; Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 288--289. 1957; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Neal, In *Gard. Hawaii*, ed. 2, 723 & 724, fig. 276b. 1965; Fournet, *Fl. Illust. Phan. Guad. Mart.* 1397 & 1399. 1978; Mold., *Phytologia* 41: 146. 1979; Steyererm. & Huber, *Fl.*

Avila 861 & 868. 1978; Mold., Phytol. Mem. 2: 104, 105, 109, 116, 122, 357, & 561. 1980.

Additional & emended illustrations: Neal, In Gard. Hawaii, ed. 1, imp. 1, 637, fig. 244b (1948), ed. 1, imp. 2, 637, fig. 244b (1949), and ed. 2, 723, fig. 276b. 1965.

Recent collectors have found this ornamental plant in coastal thickets and on forested slopes, as well as among scrubby xerophytic vegetation, from sealevel to 220 m. altitude, describing it as a shrub, 3 m. tall, in full anthesis in February, September, and November. Others have referred to it as a shrub only to 40 cm. tall, the foliage fragrant when crushed. The corollas are said to have been "white" on Steyermark & al. 108065 & 120201 and "cream"-color on Aristeguieta 2117.

Knuth (1927) cites Moritz 402 from Bolívar, Venezuela, and Ernst s.n. from Margarita Island. He reduces *L. helleri* Britton to synonymy here, as well as *L. cuneifolia* Sessé & Moc., and this may, indeed, ultimately prove to be correct. Neal (1965) reports the common name, "false thyme", as applied to this plant in Hawaii.

Additional citations: VENEZUELA: Bolívar: Moritz 492 [Macbride photos 17526] (Z--photo of logotype). Sucre: Steyermark, Espinosa, & Manara 108065 (N), 108190 (N). Táchira: Aristeguieta 2117 (W--2882584); Steyermark, Liesner, & Gonzalez 120201 (E--2774722).

LIPPIA MICROMERA var. *HELLERI* (Britton) Mold.

Additional & emended bibliography: Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 292. 1888; Urb., Symb. Antill. 4: 532. 1911; Stahl, Estud. Fl. Puerto Rico, ed. 2, 3: 292. 1937; Alain in Leon & Alain, Fl. Cuba, imp. 1, 4: 288--289. 1957; Mold., Phytologia 39: 177--178. 1978; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 217. 1979; Mold., Phytol. Mem. 2: 79, 90, 95, 98, 357, 416, 417, & 561. 1980.

Jiménez describes this plant as a very common shrub, 1.5 m. tall, erect, and very aromatic, much eaten by wild goats, and found it growing at 200 m. altitude, flowering in May. He describes the corollas as "white".

Additional citations: HISPANIOLA: Dominican Republic: J. J. Jiménez 8834 (Ld, Me).

LIPPIA MICROPHYLLA Cham.

Additional synonymy: *Lippia michophylla* Rizzini, Trat. Fitogeog. Bras. 2: 302, sphalm. 1979.

Additional bibliography: Reiche & Phil. in Reiche, Estud. Crit. Fl. Chile 5: 301. 1910; Speg., Mycet. Argent. 5: 375. 1910; Sydow, Justs Bot. Jahresber. 39 (1): 377. 1912; Fedde, Justs Bot. Jahresber. 39 (2): 1430. 1917; Lewis & Elvin-Lewis, Med. Bot. 376. 1977; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 50. 1978; Mold., Phytologia 41: 146. 1979; Mold., Phytol. Mem. 2: 122, 148, 421, & 561. 1980; Mold. & Bromley in Harley & Mayo, Toward Checklist Fl. Bahia 191. 1980.

Lewis & Elvin-Lewis (1977), referring to this plant as *Lantana microphylla*, state that its fruit serves medicinally as a stimulant

and tonic in tropical America. Recent collectors describe it as a subshrub or undershrub, 1.5--2 m. tall, with a thick woody caudex, and leaves with a *Basilicum*-like fragrance, the bracts light green. They have found the plant growing on campo and in cerrado, at 1100 m. altitude, in anthesis in March and October. The corollas are said to have been "white" on Mori & al. 9696, "cream with [a] yellow stripe in the center" on Mori & Funch 13367, and with the "tube light-yellow, limb white" on Maas & Westra 2634.

Spegazzini (1910) records the fungus, *Camarosporium andicola* Speg., as parasitic on *Lippia microphylla* in Argentina, but since *Lippia microphylla* Cham. does not occur in Argentina, it seems obvious that the plant to which he is referring is *Acantholippia deserticola* (R. A. Phil.) Mold., formerly known as *Lippia microphylla* F. Phil.

Material of *Lippia microphylla* has been distributed in some herbaria, apparently due to a typographic or stenographic error, as *L. "macrophylla"* Cham. On the other hand, the Harley 18603, 18929, & 19011, distributed as *L. microphylla*, actually are *L. schomburgkiana* Schau.

Additional citations: GUYANA: Maas & Westra 3634 (Ld). BRAZIL: Bahia: Mori & Funch 13367 (N, Z); Mori, Mattos Silva, Kallunki, Santos, & Santos 9696 (Ld, N). Goias: Hatschbach 40090 (W--2850777).

LIPPIA MODESTA Briq.

Additional bibliography: Mold., *Phytologia* 39: 179--180. 1978; Troncoso in Burkart, *Fl. Ilust. Entre Rios* 5: 272, 277, & 278, fig. 131. 1979; Mold., *Phytol. Mem.* 2: 178, 180, 189, & 561. 1980.

Additional illustrations: Troncoso in Burkart, *Fl. Ilust. Entre Rios* 5: 277, fig. 131. 1979.

Troncoso (1979) cites only Burkart 24013 and Pedersen 6306 from Entre Ríos, Argentina, giving the overall distribution of the species as Paraguay and northern Argentina, but "poco común en la provincia" [Entre Ríos].

LIPPIA MORII Mold., *Phytologia* 45: 36--37. 1980.

Bibliography: Mold., *Phytologia* 45: 36--37. 1980; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

Recent collectors describe this plant as a shrub, 2 m. tall, and have encountered it on campo rupestre, at 1000--1200 m. altitude, flowering in March. The corollas are said to have been "white" on Mori & Benton 13500.

Citations: BRAZIL: Bahia: Mori & Benton 13500 (N, Z); Mori, King, Santos, & Hage 12387 (W--2854264--isotype, Z--isotype).

LIPPIA MORONGII Kuntze

Additional bibliography: Mold., *Phytologia* 39: 180 (1978) and 40: 78 & 79. 1978; Mold., *Phytol. Mem.* 2: 148, 178, 180, 189, & 561. 1980.

LIPPIA MULTIFLORA Mold.

Additional bibliography: Noamesi, *West Afr. Journ. Pharmacol.*

Drug Res. 4: 33--36. 1977; Wickens, Kew Bull. Addit. Ser. 5: 309, map 151. 1977; Mold., Phytologia 41: 146. 1979; Noamesi, Biol. Abstr. 67: 6243. 1979; Mold., Phytol. Mem. 2: 200, 201, 205, 207, 208, 210, 211, 213--217, 220, 357, & 561. 1980.

LIPPIA MYRIOCEPHALA Schlecht. & Cham.

Additional bibliography: Schlecht. & Cham., Linnaea 6: 372. 1831; Anon., Biol. Abstr. 68: 3939. 1979; Hocking, Excerpt. Bot. A.33: 87 & 88. 1979; Mold., Phytologia 41: 146--147. 1979; Mold., Phytol. Mem. 2: 64, 72, 76, 78, 79, 81, 419, 421, & 561. 1980.

Recent collectors describe this plant as a tree, 3 m. tall, report the vernacular name, "htzinte", and have found it in wet soil, and full anthesis in January, February, September, October, and December, and in fruit in February and October, growing at 410--2600 m. altitude. Schlechtendal & Chamisso (1831) describe the plant as a tree with white "flowers" [corollas]. They note that "*Speciminibus Jalapensibus paulo magis pubescens, foliis caputulis paulo minoribus, caeterum haud diversa*". I regard these more pubescent plants as var. *hypoleia* (Briq.) Mold.

The *Acosta & Dorantes 533*, *Dorantes & Acosta 1804*, and *Lent 1783*, distributed as typical *L. myriocephala*, actually represent var. *hypoleia* (Briq.) Mold.

Additional citations: MEXICO: Chiapas: *Miranda 7062* (Me--73569. Veracruz: *Miranda 750* [DC.43024] (Me--73564); *Sharp 44812* (Me--168751); *Sousa 2559* [DC.43020] (Me--112552), *2849* [DC.43019] (Me--112587). Yucatán: *Enriquez 259* (Me--128201).

LIPPIA MYRIOCEPHALA var. *HYPOLEIA* (Briq.) Mold.

Additional bibliography: Schlecht. & Cham., Linnaea 6: 372. 1831; Anon., Biol. Abstr. 68: 3939. 1979; Mold., Phytologia 41: 147. 1979; Mold., Phytol. Mem. 2: 65, 72, 74, 76, 78, 79, 81, 376, 420, 421, & 561. 1980.

Recent collectors describe this plant as a common shrub or tree, 6--15 m. tall, and have encountered it in pastures, along roadsides, in evergreen forests on steep slopes, in open meadows, at the edges of disturbed evergreen forests on hillsides, along small streams, in deciduous forests, and "in acahual of 2 years of *Helicteres guazumaefolia*, *Terminalia amazonia*, and *Waltheria brevipes*", at 400--1500 m. altitudes, flowering in January and from September to November, and fruiting in October and November. The corollas are said to have been "greenish" on *Acosta & Dorantes 533* and *Dorantes & Acosta 1804*, "white" on *Stevens 5819* & *6089* "very pale-yellow" on *Vincelli 46*, and "light-cream to yellow" on *Lent 1783*.

Additional citations: MEXICO: Veracruz: *Acosta & Dorantes 533* (Ld); *Dorantes & Acosta 1804* (Ld); *Gonzalez Leija & Garza 8087* (Me--139741); *Miranda 4872* [DO.43023] (Me--85319, Me--85320); *Vazquez T.32* (N), *65* (N). GUATEMALA: Baja Veracruz: *Williams, Molina R., Williams, & Molina 40683* (W--2862462). NICARAGUA: Chontales: *W. D. Stevens 6089* (Ld); *Vincelli 46* (Ld). Managua: *W. D. Stevens 5819* (Ld). COSTA RICA: Cartago: *Lent 1783* (Go).

LIPPIA MYRIOCEPHALA var. *INTEGRIFOLIA* Loes.

Additional bibliography: Mold., *Phytologia* 39: 252, 253, & 258. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 72, 76, 78, & 561. 1980.

LIPPIA MYRIOCEPHALA var. *OVATIFOLIA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 39: 258. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 65, 72, 420, & 561. 1980.

LIPPIA NANA Schau.

Additional bibliography: Mold., *Phytologia* 39: 258--259 & 444. 1078; Mold., *Phytol. Mem.* 2: 148 & 561. 1980.

LIPPIA NEPETACEA Schau.

Additional bibliography: Mold., *Phytologia* 39: 259 & 438. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 148, 421, & 561. 1980.

LIPPIA NIGERIENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 259. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 211, 213, 234, & 561. 1980.

LIPPIA OATESII Rolfe

Additional bibliography: Mold., *Phytologia* 39: 259--260 & 394. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 234, 236, 238, & 561. 1980.

LIPPIA OAXACANA Robinson & Greenm.

Additional bibliography: Mold., *Phytologia* 39: 260. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 65 & 561. 1980; Mold., *Phytologia* 48: 165. 1981.

Recent collectors describe this species as a shrub, about 1 m. tall, and have found it growing along ravines and on "ladera caliza" in "selva baja caducifolia", flowering in August and October, fruiting in August. The corollas are described as "lobes white, tube dark-yellow" on *Lundell & Lundell 12507*. This collection was distributed as and previously incorrectly cited by me as *L. chrysantha* Greenm.

Additional & emended citations: MEXICO: Guerrero: *Blanco, Toledo, & Cabrera 583* (He--276273), Morelos: *Lundell & Lundell 12507* (Ld, Ld, Mi, N).

LIPPIA OBOVATA Sessé & Moc.

Additional bibliography: Mold., *Phytologia* 39: 260. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phytol. Mem.* 2: 65 & 561. 1980.

LIPPIA OBSCURA Briq.

Additional bibliography: Mold., *Phytologia* 39: 260--261 (1978) and 40: 82. 1978; Anon., *Biol. Abstr.* 68: 3939. 1979; Mold., *Phy-*

tol. Mem. 2: 148, 178, & 561. 1980.

Additional citations: BRAZIL: Mato Grosso: Kirkbride & Lleras 3044 (N).

LIPPIA ORIGANOIDES H.B.K.

Emended synonymy: *Lippia origanoides* Humb. & Bonpl. apud Steud., Nom. Bot. Phan., ed. 1, 486. 1821.

Additional bibliography: Steud., Nom. Bot. Phan., ed. 1, 486 (1821) and ed. 2, 1: 664 (1840), and ed. 2, 2: 54. 1841; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 602. 1927; Anon., Biol. Abstr. 68: 3939. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytologia 41: 147--148 & 151. 1979; Mold., Phytol. Mem. 2: 105, 109, 116, 148, 357, 415, 421, & 561. 1980.

Knuth (1927) reduces *L. elegans* Cham. to synonymy here and cites from Venezuela the following collections: Bermudez: Humboldt & Bonpland s.n. Distrito Federal: Otto, 456, Pittier 8096 & 9671. Miranda: Pittier 8251. Zulia: Pittier s.n. He reports the vernacular name, "orégano".

Recent collectors refer to this plant as a shrub, about 2 m. tall, the leaves aromatic, used for flavoring meat and fish dishes, and have found it cultivated in cleared areas near dwellings in Vaupés, Colombia, and on steep rocky slopes with a great variety of trees, at sealevel to 50 m. altitude, flowering and fruiting in June, also in anthesis in September. The corollas are said to have been "white" on Steyermark & al. 108064.

Additional citations: VENEZUELA: Sucre: Steyermark, Espinosa, & Manara 108064 (N), 108193 (N). Los Venados Island: Steyermark, Espinosa, & Manara 108078 (L). CULTIVATED: Colombia: Zarucchi 1315 (Ld). Venezuela: Tamayo 4147 (N).

LIPPIA OXYCNEMIS Schau.

Additional bibliography: Anon., Biol. Abstr. 68: 3939. 1979; Mold., Phytologia 41: 148. 1979; Mold., Phytol. Mem. 2: 149 & 561. 1980.

Recent collectors describe this plant as a coarse herb, about 1.8 m. tall, the involucral bracts red-purple, and have found it growing in meadows, at 1000 m. altitude, flowering in April. The corollas are said to have been "pale-lavender with [a] red-violet nectar-guide in the throat" on the collection cited below.

Additional citations: BRAZIL: Distrito Federal: Plowman 10002 (N).

LIPPIA OXYPHYLLARIA (Donn. Sm.) Standl.

Additional bibliography: Anon., Biol. Abstr. 68: 3939. 1979; Mold., Phytologia 41: 148. 1979; Mold., Phytol. Mem. 2: 76, 81, 84, 421, & 561. 1980.

LIPPIA PALMERI S. Wats.

Additional synonymy: *Lippia palmeri* var. *palmeria* Spellensb., ex Mold., Phytol. Mem. 2: 421, in syn. 1980.

[to be continued]

A NEW PEPEROMIA FROM NICARAGUA

William C. Burger

Field Museum of Natural History
Chicago, Illinois, 60605

It was in 1961 that Dr. Louis O. Williams began a program of active field work in Central America, complementing his work on the Flora of Guatemala project. Together with Antonio Molina of the Escuela Agrícola Panamericana, Honduras, and their associates, a number of collecting trips were made into the Cordillera Central of Nicaragua, an area little collected before. Among the many interesting plants that were collected in these moist evergreen forests was a delicate little peperomia (Piperaceae) quite unlike other small-leaved species known from southern Central America. It is described here and named after the province in which most of its collections have originated.

PEPEROMIA MATAGALPENSIS W. Burger, sp. nov.

Herbae procumbentes vel erectae, usque ad 20 cm altae, caules plerumque cum radicibus adventis. Foliae verticillatae (4, 5, 6, 7), petiolis 1-2 mm longis, laminis 4-8 mm longis et 1.5-3 mm latis, anguste obovatis, glabris. Inflorescentiae terminales solitariae, spicae 4-7 mm longae super pedunculis 4-8 mm longis, bractae 0.3-0.4 mm latae. Fructus circa 0.6 mm longi, anguste ovoidei sessilibus, stigmatе terminali. HOLOTYPE: L. O. Williams, A. Molina, & T. P. Williams 24762, Field Museum 1729289; ISOTYPE: EAP, BM, MO. In mossy forest at 1800 meters, above Jinotega, 20 February 1963.

Herbaceous epiphytes, thin stemmed and glabrous, much branched and rooting from many nodes, leaf-bearing internodes 3-20 mm long, about 0.5 mm thick when dry. Leaves whorled at the node, 4 to 7 per node (rarely 2), rather uniform in size and shape both within and between plants, petioles 1-2 mm long; laminae 4-6 (8) mm long, 1.5-2.5 (3) mm broad, narrowly obovate to oblanceolate, rounded at the apex, gradually narrowed at the petiole, essentially glabrous, drying thin. Inflorescences terminal and solitary on short (5 cm) stems, peduncle 5-8 mm long, flowering rachis 4-7 mm long, 0.5-1 mm thick, glabrous, bracts 0.3-0.4 mm broad, ovary partly immersed in the axis of the spike. Fruit about 0.6 mm long, ovoid, often borne at a 45 degree angle to the apex and with only the base imbedded in a shallow depression in the rachis, stigma apparently terminal.

Peperomia matagalpensis is a plant of cloud forests and mossy forests in Nicaragua's central highlands. It has been collected in the departments of Madriz, Matagalpa, and Jinotega at elevations from 1300 to 1800 meters. Collections seen in addition to the type are: A. Molina 20262, 20353 and 20381; Williams, Molina and Williams 23376 and 23628; Williams et al. 27599, 29163, 29210. All of these collections were made in the early part of the dry season, January, February and March but I am sure that this is a reflection of collecting schedules and the species probably flowers at other times of the year as well.

This species is easily distinguished from others of the genus, both in Nicaragua and nearby Costa Rica. Its small thin and narrow whorled leaves are reminiscent of Costa Rica's *P. pittieri* but that species has lamina that are abruptly narrowed at the base and the fruit are pedicellate. Our new species resembles small individuals of *P. galioides* but those plants are usually puberulent on the petioles, have thick erect main stems, and larger emarginate leaves, while the fruit has a subapical stigma. This leaves us with *P. quadrifolia* as the most likely relative in Central America. *Peperomia quadrifolia*, however, has much thicker and round leaves, though it does have the terminal stigma. Some of the collections had been identified as *P. galioides* and *P. deppeana*. The latter species has a puberulent rachis and rounded leaves. These comparisons make clear that we have a very distinctive species here, apparently confined to the central highlands of Nicaragua.

All the collections cited were made on expeditions supported in part by the National Science Foundation (USA) under grants GB 698, GB 3106, Field Museum of Natural History and the Escuela Agrícola Panamericana. The unusual nature of these plants came to light while working with the Piperaceae of Costa Rica, supported in part by NSF grant GB 7300. In the decade since their unusual nature was detected I have been unable to find a name for these plants or to locate conspecific material outside of Nicaragua



PEPEROMIA
matagalpensis

NOTEWORTHY GRASSES FROM MEXICO VIII.

Alan A. Beetle, Comision Tecnico Consultiva para
la Determinacion Regional de los
Coeficientes de Agostadero
A.P.D.O. Postal 284, Hermosillo,
Sonora, Mexico

For previous papers see *Phytologia* 27:1974; 28:1974; 30:1975; 35:1977; 38:1978; and 47:1981.

A recent survey (Beetle, A.A. 1980. Vivipary, proliferation, and phyllody in grasses. *Journal of Range Management* 33:256 - 261.) has shown that vivipary is primarily a cool season, festucoid phenomenon. Only examples in Eragrostae (Eragrostis), Panicum and Paspalum), and Andropogoneae (Sorghum and Zea) have involved warm season grasses. However, during recent field work in Mexico four examples of warm-season grasses exhibiting vivipary caused by too much water about the roots have been discovered. Perhaps vivipary is not as rare in the tropics as has been thought.

(1) Echinochloa colonum (L.)Link f. viviparum f. nov.

Haec forma a forma typica speciei spiculae viviparae.

Type: Mexico, Sonora, Valle del Yaqui, "terreno con bastante humedad constante", April 20, 1979, Coll. Miguel R. Lopez Lopez.

I have not seen the type or the original description of Echinochloa colonum (L.)Link var. glomerulosum Lojac. Fl. Sicul. 3:268. 1909. "Sicilia in Herb. Pan!" from Italy, but the name "glomerulosum" strongly depicts the form of the shortened racemes of f. vivipara as found in Sonora, Mexico.

(2) Cynodon dactylon (L.)Pers. f. vivipara f. nov.

Haec forma a forma typica speciei spiculae viviparae.

Type: Mexico, Tamaulipas, between Ciudad Victoria and Soto La Marina, associated with Typha latifolia, Dec. 9, 1979, Coll.: A.A.Beetle M - 4442.

- (3) Bouteloua curtipendula (Michx.) Torr. var. tenuis Gould and Kapadia f. vivipara f. nov.

Bouteloua curtipendula similis sed spiculae viviparae.

Type: Mexico, Jalisco, between Sayula and Ciudad Guzman, Sept. 18, 1980, Coll.: A.A.Beetle M - 6079.

- (4) Dactyloctenium aegyptiacum (L.) Willd.
f. vivipara f. nov.

Dactyloctenium aegyptiacum similis sed spiculae viviparae.

Type: Mexico, Sonora, Hermosillo, edge of irrigation ditch, Oct. 19, 1980, Coll.: B. Bracamonte C. no. 31.

Digitaria ciliaris Retz. var. chrysoblepharis
(Fig. & DeNot.) comb. nov.

Digitaria chrysoblephara Fig. & DeNot. Mem. Acad. Sci. Torino II. 14:364. 1854, African.

Digitaria adscendens (HBK) Henr. ssp. chrysoblepharis (Fig. & DeNot.) Henrard, Monogr. Digitaria 160, 998. 1950.

cf. Bor, Grasses of Burma, Ceylon, India and Pakistan 299. 1960.

Apparently described from Africa, then reported for India, and now reported from Mexico, Morelos, near Cuautla, Sept. 4, 1971, Coll.: A.A.Beetle M - 1635.

Glyceria mexicana (Kelso) comb. nov.

Glyceria striata (Lam.) Hitchc. var. mexicana
Kelso, Rhodora 37:263. 1935.

The spikelets of G. mexicana are significantly larger than those of G. striata. The glumes are 1.5 to 2 mm. long, the lemmas 2.5 to 3 mm. long. The type in the U. S. National Herbarium is P. Lyonnet 267 from the State of Mexico, at El Chico. Glyceria mexicana has been reported from Nuevo Leon, Hidalgo, Mexico, Morelos, Oaxaca and Chiapas.

Collections from Sonora and Chihuahua are Glyceria striata in which the glumes are 0.5 to 1 mm. long; the lemmas are only 2 mm. long.

Gould (cf. Gould, F.W. 1980. Brittonia 32 (3): 353 -364) offers a conservative and satisfactory overview of some Mexican species of Panicum which have been treated recently under Dichanthelium. The treatment does not seem to be complete as no mention is made of P. cordovense, P. ciliatum, P. pseudopubescens, P. hintoni, P. olivum, or P. ensifolium, nor does the treatment offer convincing proof that a different genus is necessary. In accepting the species limitations but not the generic limitations for a forthcoming grasses of Mexico it is found necessary to make the following new combinations.

- (1) Panicum laxiflorum Lam. var. strictirameum
(Hitchcock and Chase) comb. nov.

Panicum xalapense subsp. strictirameum Hitchc.
and Chase, Contrib, U.S.Nat'l.Herb. 15:161. 1910.
Panicum rubrechtii Fourn. Mex.Pl.Gram. 21. 1886.
Panicum xalapense HBK. Nov. Gen.&Sp. 1:103. 1815.

- (2) Panicum leucoblepharis Trin. var. pubescens (Vasey)
comb. nov.
Panicum laxiflorum Lam. var. pubescens Vasey,
Contr. U. S. Nat'l. Herb. 3:30. 1892.
Dichanthium leucoblepharis (Trim.) Gould and
Clark, Ann. Missouri Bot. Gard. 65 (4):1101. 1978.
- (3) Panicum aciculare Desv. var. arenicoloides (Ashe)
comb. nov.
Panicum arenicoloides Ashe, Jour. Elisha Mitchell
Soc. 16:89. 1900.
- (4) Panicum aciculare Desv. var. ovinum (Scribn. and
Smith) comb. nov.
Panicum ovinum Scribn. and Smith, U.S. Dept. Agric.
Div. Agrost. Circ. 16:3. 1899.
- (5) Panicum oligosanthos Schultes var. scribnerianum
(Nash) comb. nov.
Panicum scribnerianum Nash, Bull. Torrey Bot. Club
22:421. 1895.
- (6) Panicum acuminatum Sw. var. villosum (A.Gray)
comb. nov.
Panicum nitidum Lam. var. villosum Gray, N. Amer.
Gram. & Cyper. 2:111. 1835.
Dichantherium acuminatum (Sw.) Gould and Clark, var.
villosum (A.Gray) Gould and Clark, Ann. Missouri
Bot. Gard. 65:1124. 1978.
- (7) Panicum acuminatum Sw. var. implicatum (Scribn.)
comb. nov.
Panicum implicatum Scribn. U.S.D.A. Div. Agrost.
Bul. 11:43, fig. 2. 1898.
Dichantherium acuminatum var. implicatum (Scribn.)
Gould and Clark, Ann. Missouri Bot. Gard. 65:
1126. 1978.

- (8) Panicum acuminatum Sw. var. lindheimeri (Nash)
comb. nov.

Panicum lindheimeri Nash, Bull. Torrey Bot.
Club 24:196. 1897.

Panicum lanuginosum Elliott var. lindheimeri
(Nash) Fernald, Rhodora 36:77. 1934.

Dichanthelium lindheimeri (Nash) Gould,
Brittonia 26: 60. 1974,

BOOK REVIEWS

XI

George M. Hocking
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Auburn, Alabama

"COMMON WEEDS OF THE UNITED STATES," by the Agricultural Research Service, U.S. Department of Agriculture. v + 1-463, 222 figs., 219 maps. Dover Publications, Inc., New York. 1971 (1970). \$6.50.

The format used in the present volume, one commonly seen, consists of a page of text opposite to a page of illustrations (also a map). In this way, a detailed study is presented of 224 species of weeds selected from a listing of 1775 species published by the Weed Science Society of America. The order of plants is described as an evolutionary one, from the simplest to the more complicated, thus following the general order of Engler. Although nothing is said of control, the book is a very useful one, both to botanists and non-botanists interested in plants. In reprinting, the title has been changed from the original "Selected Weeds of the United States."

GMH

"NURSES' DRUG REFERENCE," by Joseph A. Albanese (R.Ph., Ph.D.) x + 1-694. McGraw-Hill Book Co., New York (etc.) 1979. \$14.95.

This attractive volume is principally made up of monographs on various important medical products, generally covering about two pages, however varying from one to four pages in length. These are arranged in a strict alphabetic sequence of generic names, running from Acenocoumarol to Warfarin Sodium, both anticoagulants, coincidentally. The information is recorded in a strict format as follows: Category, brand name, preparations, legal status, description, pharmacologic mechanism, therapeutic uses, dose ranges, dispensing information, patient instructions, storage requirements, and contraindications. The various indexes precede this section: generic name, brand name, and pharmacologic use (the latter under generic and brand name also). The third part (following the monographs) bears such useful information as tables of weights and measures, equivalents, adverse drug reactions, medical abbreviations, various biologicals in use, immunization schedules, management of overdoses, laboratory reference values (blood, urine, etc.) Part Four is the Appendix, bearing lists of controlled substances, nursing directory, nursing publications, manufacturers' index, bibliography, etc. While the drug coverage is quite large, there are as might be expected some omissions of quite important drug items, such as Lomotil, Robaxin, etc. This volume will be of value for several years to come not only to the nurse but also to the physician, pharmacist, dentist, and others who use or dispense drugs of the modern armamentarium.

GMH

"FRONTIERS OF PINEAL PHYSIOLOGY," edited by Mark D. Altschule. xii + 269 pp., 69 figs., 25 tabs. The MIT Press, 28 Carleton St., Cambridge, Mass. 02142. 1975. \$17.50.

The pineal gland or epiphysis has some time been called "the sleeping giant of endocrinology," with reference to its potentialities in therapy which are not even yet fully comprehended. In the past, even the recent past, the functions of this organ have been unknown, but now there is beginning to emerge a pattern of properties which might even yet position this "glandule" as one of the most important therapeutic agents. The volume is made up of papers presented at a conference held at Boston in 1970. There are 20 authors listed; this includes the editor. Except one author from the Argentine (Cardinale), all are from the USA. There are nine chapters: the first deals with the history of man's knowledge of the pineal. (Descartes thought it was the "seat of the soul"). There are successive chapters on relation of light, melatonin synthesis, melanotropic-lipolytic peptides, gland as organ of internal secretion (this Ch. 5 is the longest in the book), effect on NADP/NADPH ratio in liver, carbohydrate metabolism, behavior, and effect on schizophrenia symptoms. Experimental studies indicate that the pineal gland plays an important and sensitive role in neuro-endocrinal mechanisms and responding to light stimuli and biosynthesizing serotonin. It appears to affect the pituitary-gonadal axes and to modify sexual behavior. The pineal also seems to possess sedative effects which might be useful in some types of schizophrenia. Thus, it appears that the pineal has great potential value in the control of human health and behavior.

GMH

"CLINICAL ONCOLOGY: AN MANUAL FOR STUDENTS AND DOCTORS. EDITED UNDER THE AUSPICES OF THE INTERNATIONAL UNION AGAINST CANCER," Ed. 2, fully revised and enlarged. Anonymous. XV + 304 pp., 31 figs. Springer-Verlag - Berlin, Heidelberg, New York. 1978. DM 29,--; US \$ 14.50.

This manual has the ring of authenticity since it was published under the aegis of a most prestigious organization, the IUAC, with headquarters at Geneva. The volume reviewed was published in English but it was expected to have versions in about ten additional languages. The revision was carried out by seven outstanding authorities in the field of oncology. The text is made up of four parts: General; Cancer of specific sites (ex. lung, palate); basic science research having potential or actual impact on study of tumors; and five appendices. One of the points emphasized in the text is the chronic course of most cancers, with a career lasting from 22 to 50 years (or more). Four phases in the history or evolution of the disease are recognized: induction; "in situ"; invasion; and dissemination. The latter normally of course eventuates in the death of the patient. All phases of the disease are considered: epidemiology, etiology, pathology, natural history, diagnosis, therapy, psychological treatment, and prognosis.

GMH

"INFLAMMATION AND ANTIINFLAMMATORIES," by Edoardo Arrigoni-Martelli
 XIII + 343 pp., 48 figs., 48 tabs. Spectrum Publications, Inc., New York
 (Distributor Hsted Press, div. of John Wiley & Sons, New York). 1977.
 \$30.00.

In 22 chapters, the author explores theories of causation of inflammation, with detailed study of the mediators, which are more or less directly responsible for the phenomenon. Among the mediators, separate chapters are devoted to histamine, serotonin, bradykinin, and the prostaglandins. The meanings of some technical terms in serology have changed. Thus, today complement is applied to designate a group of serum proteins which "interact sequentially to effect a variety of inflammatory events." Also, properdin now refers to a single protein which interacts with complement, reducing the inflammatory process. While prostaglandins mediate inflammation, they also act to moderate inflammation. Slow-reacting substances (SRS) are produced in anaphylaxis and other reactions and also serve to mediate inflammation. Lysosomes (cell organelles containing hydrolases) also act as mediators of inflammation and also promote cell injury. The process of release of mediators from their storage places is also a complex one, which is discussed in the first chapter and elsewhere throughout the volume. The first ten chapters deal with presumed causes of inflammation. Midway in the book the therapy of inflammation comes forward; there are chapters on evaluating the efficacy of these and theories of their action. Non-steroidal antiinflammatory agents are discussed in three chapters. There are also chapters on immunosuppressive agents, immunoregulant agents, d-penicillamine, gold compounds, antiinflammatory proteins (enzymes, chalones), and antigout agents (such as colchicine and probenecid). Not much attention is given to the steroidal antiinflammatories (as cortisone) except for mention in the chapter on "Evaluation of antiinflammatory agents." To sum up, this text is chiefly concerned with the physiopathological etiology of inflammation (particularly as seen in arthritis) and the modes of determining the efficacy of antiinflammatory agents, particularly the models used in this procedure. This very useful text is provided with a great many references at the ends of each chapter, and will be of service to the medico, pharmacologist, physiologist, and biochemist. The author from Milan is now the director of the pharmacology department of Leo Pharmaceutical Products, of Ballerup, Denmark. (The index is not always adequate).

GMH

"DALEAE IMAGINES (concepts of Dalea). An illustrated revision of Errazurizia Philippi, Psorothamnus Rydberg, Marina Liebmman, and Dalea Lucanus emend. Barneby, including all species of Leguminosae tribe Amorpheae Borissova ever referred to Dalea," Memoirs N.Y. Bot. Garden, by R.C. Barneby, 27: viii + 1-892, 1 fig., 143 pls; 1977.

In this monograph are presented the taxa of four genera (see title) of tribus Amorpheae Borissova emend. Barneby. There are many new taxa, including the following: subgen. nov. 4, sect. nov. 2, ser. nov. 23,

spp. nov. 36, var. nov. 26, nom. et stat. nov. 4, stat. nov. 46, nom. nov. 3, comb. nov. 66. (total of 210 novelties). The numbers of spp. recognized in the 4 genera are: Errazurizia: 4; Psorothamnus 9; Marina: 38; Dalea: 161 described ("certainly somewhat more"). Also discussed are spp. incertae sedis ignotaeque; nomina nuda; and spp. exclusae. Many new counts for chromosome numbers are given contributed by T. Mosquin (54 taxa in Dalea, 7 Marina, 1 Psorothamnus) and R. Spellenberg (3 Dalea, 1 Marina, 1 Psorothamnus). Following the plates is an index of plant names. (A listing of the new taxa is available).

GMH

"A GUIDE TO THE GENERA OF NATIVE AND COMMONLY INTRODUCED FERNS AND SEED PLANTS OF EASTERN NORTH AMERICA FROM THE ATLANTIC TO THE GREAT PLAINS FROM KEY WEST-SOUTHERN TEXAS INTO THE ARCTIC." Short title: "Genera of the Eastern Plants." W.T. Batson, John Wiley & Sons, Inc., Somerset N.J. - IV + 1-203, many figs., 1977. Paper bound. Price \$5.50. (Ed. 3).

This small volume bears a wealth of information on the plants of eastern North America. 1679 genera are covered and are supposed to be identifiable through the use of this guide. The merits of the coverage are obvious when one considers how often plants migrate from region to region. It was estimated that if the same number of taxa were covered as conventionally they are in a flora, it would require a book with 2500 to 4000 pages, a volume both cumbersome and expensive. Identification as far as genus is often the most practicable; for one thing, many genera have only a single sp. or the genus in a particular area will often have only a single sp. Another reason is that to identify as far as genus is often sufficient for the purposes at hand. To identify the particular sp. within the genus often requires the usage of a special detailed treatment and considerable difficulty. This book contains a series of keys, provided with interlinear sketches of plants or plant parts. Glossary, index. A very useful little book.

GMH

"ADJUVANT THERAPIES AND MARKERS OF POST-SURGICAL MINIMAL RESIDUAL DISEASE. I. MARKERS AND GENERAL PROBLEMS OF CANCER ADJUVANT THERAPIES," II. ADJUVANT THERAPIES OF THE VARIOUS PRIMARY TUMORS," edited by G. Benadonna, G. Mathe, and S.E. Salmon. I: XVII + 150 pp., 64 figs., 40 tabs. / II: XI + 465pp., 181 figs., 218 tabs. Springer-Verlag, Berlin, Heidelberg, New York. 1979. I: DM 48.-- (US \$26.40); II: DM 98.-- (US \$53.90). (Recent Results in Cancer Research Vols. 67,68).

Under the direction of an Italian, Swiss, and US editor, the many papers presented at the 1978 Annual Plenary Meeting of the European Organization for Research on Treatment of Cancer (EORTC) (held in Paris) are presented in these two volumes. A list of all of the 326 participants is given in the first volume. The text is totally in English. Volume 67 is chiefly concerned with markers but with about one-third the volume treating of therapies in a general way (radiotherapy, chemotherapy, and immunotherapy). The second volume gives detailed information on specific kinds and locations of cancers (for instance, gliomas (brain parenchyma tissue cancers)). Tumor markers include such substances as ACTH, lipotropin, and casein,

which are produced by tumors and are amenable to assay by varieties of chromatography and other means. Other markers include prostatic acid phosphatase, sialyl transferase, catecholamines, dopamine, B-endorphin, fetoprotein, and carcinoembryonic antigen (CEA). Markers are chiefly used to determine if there is any cancer tissue left in the body ("post-surgical minimal residual disease") (PSMRD). Adjuvant therapy is therapy used to aid or synergize other types of treatment and here to aid in eradicating the last vestiges of PSMRD. Both synthetic and natural origin drugs are used in this type of therapy, among the latter being adriamycin, interferon, BCG (used in immunotherapy), vincristine and vindesine, hormones, bleomycin, and others. In vol. 68, many types of malignant disease are spoken of: Wilms' tumor, sarcomata including osteosarcoma, carcinomata of ovary, uterus, and testis, digestive tract, bronchus, urinary tract, nervous system, etc. The indications for which the markers and types of therapy are discussed are applicable to that 70% of cancer patients who relapse before the fifth year following surgery. A great many abbreviations are used in the text, many not found in comprehensive large size medical dictionaries. There is no index.

GMH

"TASCHENWOERTERBUCH DER BOTANISCHEN PFLANZENNAMEN, FUER GAERTNER, BAUMSCHULER, GARTEN-UND PFLANZENFREUNDE, LAND-UND FORSTWIRTE," by Franz Boerner. 3.A. (ed. 3). 435 pp. Verlag Paul Parey, Berlin u. Hamburg. 1978.

This most excellent little dictionary of plant names has been coming out since 1951. The small size permits it to be readily placed in the pocket for ready reference in field, laboratory, herbarium, or library. The following are its chief features: a good solid clear exposé of the meaning and use of plant names (45pp.); index of generic names and their derivation (139 pp.); index of specific names and their meanings (160 pp.); index of Germ plant names, with genus or genera to which applied (48 pp.); index of important author names and their abbreviations, also brief notes, mostly vital data (42 pp.); and literature citations (lp.). The book is neatly printed and compact and should well serve its purpose as a "book of all seasons."

GMH

"INTRODUCTION TO THE ALGAE: STRUCTURE AND REPRODUCTION," by Harold C. Bold and Michael J. Wynne. xiv + 1-706, 516 figs., Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632. 1978. \$24.95.

In this impressive work, nine divisions are recognized, including the Cyanochloronta (so named rather than by the more usual Cyanophycophyta because of some doubt as to their full recognition as true algae); Chlorophycophyta; Charophyta; Euglenophycophyta; Phaeophycophyta; Chrysophycophyta; Rhodophycophyta; and Cryptophycophyta. This systematic portion of the text is preceded by a 30-page introductory first chapter which explains all of the usual general facts about the Algae including the chorology, form, modes of reproduction, cultivation, classification, paleobotany, and economic importance. The remainder of the volume explores each

of the divisions in turn, with an appendix on algal cultivation, a glossary, a very large bibliography (concentrated here from all the volume) and two indexes. A single comprehensive literature section is advantageous. The glossary defines all (or nearly all) of the words which appear in bold face type in the text (another innovation). Keys appear frequently in the text and are most welcome. The glossary would have been more accessible if placed after the bibliography and before the indexes. Some of the organisms included are often claimed by the zoologists, for instance, the Volvocales, which is treated among the animals as belonging to family Volvocidae in Order Phytomonadina and Class Mastigophora. No mention could be found in the text of this confusing possibility, about which it would seem students should be forewarned. Pleurococcus does not appear in the taxonomic index, which is surprising since Strasburger (for instance) refers to it under Chaetophorales as perhaps the commonest terrestrial alga in the world. No mention appears of placement of some of Cyanochloronta with the Schizomycetes into the Schizophyta. The diatom Isthmia is not mentioned.

GMH

"HEALTH SCIENCES INFORMATION SOURCES," by Ching-Chih Chen. xxxix + 1-767. The MIT Press, 28 Carylton St., Cambridge, Mass. 02142. 1981. \$50.00.

This reference volume is said to be the first modern guide to information sources in this area, which has grown so tremendously in recent years. In her classification of information sources, the author uses 24 divisions in a vertical arrangement (listed below) and then arranges under each horizontally some 23 or so distinctive fields of medical areas, such as Dermatology, Nutrition, and Pharmacy and Pharmacology. The 24 classes of data sources are: selection tools, literature guides, bibliographies, encyclopedias, dictionaries, handbooks, tables, (almanacs, etc.), manuals (lab books, etc.), guides, atlases, directories (yearbooks, etc.), history, series (and other reviews), treatises, monographs, abstracts (indexes, etc.), periodicals, technical reports (incl. government documents), conference proceedings (dissertations, etc.), classifications (standards, patents), trade literature, nonprint materials (such as microforms), professional societies (publications), and data bases. In excess of 4000 sources have been indicated. Entries are by title rather than by author, but an author index renders this access available. In an effort to make the work current, no publications appearing before 1970 are generally used and in fact most references date between 1975 and 1980. The coverage seems limited to works in the English language, thus including items published in Britain, the USA, Canada, etc., for the most part. Most of the references given are annotated, although not always based on the author's own inspection of the item. Also, in many instances, one or more references are given to literature which reviews or discusses the particular references (mostly as book reviews). A better idea of the value of some references would have been furnished if the number of pages in the book had been given. Thus, the "Pharmaceutical Directory" (APhA) (p. 301) consists of a small pamphlet of only some 30-40 pages and is of less value than might be conveyed by the title. Prices would also have been helpful.

There could have been more cross-referencing; thus, for instance, reference to the valuable Merck Index could have been included under the category "Classifications, standards and patents." Under professional societies, only the APhA and A S Hospital Pharm. are indicated; why not the AACP, Amer. Soc. Pharmacognosy, and others? There should have been more entries under Pharmacognosy (the author comes closest to this by mentioning herbal medicine); thus with abstracts under Pharmacognosia in *Excerpta Botanica Sectio A* (Stuttgart). On the whole, it can be said that the book is excellent as far as it goes but in some areas it does not go far enough. The book will prove of inestimable value to many different professional groups—to librarians, physicans, research people, and professionals in all of the health sciences. There can be no question of its very real value!

GMH

"SCIENTIFIC AND TECHNICAL INFORMATION SOURCES," by Ching-Chih Chen.
xxxi + 1-519, The MIT Press, Cambridge, Mass, and London, England.
1977. \$28.50.

An excellent coverage of the fields of pure and applied science is provided in this volume. Most of the references cover the period 1970-76 so that it is timely, even five years after publication. There are ca 3700 reference sources, hence it is obviously comprehensive. Subject areas considered include general science, astronomy, mathematics, physics, chemistry (both general and specific fields), biology (botany, zoology), the earth sciences (including oceanography), various fields of engineering, material science, metallurgy, nuclear engineering, energy and the environmental sciences. There are 23 categories of reference materials, viz., "selection tools (such as book lists and library catalogs), guides to the literature, bibliographies, encyclopedias, dictionaries, handbooks, tables (almanacs, data books, statistic sources), manuals (lab books, source books, work books, "how-to-do-it" manuals), guides and field guides, atlases and maps (also gazeteers), directories (yearbooks, biographical sources), histories, important series (and other reviews of progress), treatises and monographs, abstracting organs (indexes, current-awareness services), serials (periodicals), technical reports (including government documents), conference proceedings (plus translations, dissertations, preprints, reprints), patents and standards, trade literature, non-print materials, publications and services of professional societies, and data bases. The main section of references is followed by a reference source list and the indexes.

GMH

"THE CORTICIACEAE OF NORTH EUROPE," by John Eriksson and Leif Rywarden. Vol. 2, Aleurodiscus - Confertobasidium. pp. 59-261, 24 pls., 90 text figs. Fungiflora, Blindernveien 46c, Oslo, Norway. 1973. NNNr. 54.

This was the first volume of the work to be published and was followed by volumes 3 (1975), 4 (1976), and 5 (1978). Since the last genus covered in Vol. 5 was Phaerochaete, it appears that more volumes are on the way. Volume 1 will be published last of all. The text is in good proper English, the printing and paper superb; this work should be of service to mycologists everywhere, since for one thing fungi are so often found worldwide. Volume 2 includes one new genus (Ceraceomerulius, with three new combinations, plus new species of Athelia (1), Byssorcticium (1), and Ceratobasidium (2). There are also three more new combinations. Keys to species, synonymy, descriptions, data on habitat and distribution, and remarks (miscellaneous information) are given.

GMH

"LAS YERBAS DE LA GENTE: A study of Hispano-American medicinal plants," by Karen Cowan Ford, Anthropological Papers, Museum of Anthropology, University of Michigan No. 60: vii + 438 pp., 1 map; 1975. Price \$5.00

This text consists of seven voluminous appendices preceded by a dozen pages of introductory information and followed by 5 pages of bibliography. The appendices consist of tables showing the vernacular Spanish and equivalent botanical names and many other data of many herbs used in the folk-medical practices of Spanish-American natives of the south-western USA and Mexico. These lists vary greatly in volume and complexity. Two of the appendices concern drugs obtained from the public market at Ciudad Juarez, Mexico, another appendix lists plants discovered in the form of drugs at various local markets of Mexico, while two other appendices represent listings of crude drugs at two drug stores in New Mexico, with an analysis of the various agents. App. F is a glossary of Spanish language names of medicinal plants of drugs compiled from the author's own studies, unpublished manuscripts, etc., and would seem to be one of the most comprehensive such listings available. App. G lists the scientific plant names represented in the various parts of this volume.

GMH

"Shakespeare and medicine," by Karl Stephan. Mediz. Monatsspiegel 1964: 130-4.

From a study of his plays and poems, it can be discovered that the great dramatist knew considerable not only about Elizabethan medicine but also about that of the ancient Greeks and Romans. Several quotations are given from his various plays in illustration of his medical knowledge.

GMH

"THE ISLAND AND COASTAL VEGETATION AND FLORA OF THE NORTHERN PART OF THE GULF OF CALIFORNIA," by R. S. Felger and C. H. Lowe. Nat. Hist. Museum, Los Angeles County, Contr. in Sci. #285: 1-59; 1976.

The plants of eight major islands on the Sonoran side of the Gulf of California are discussed in some detail. The major plant communities are classified and characterized. Checklists given for the vascular plants of the islands are substantially complete except for Isla Tiburón.

GMH

"BOTANISTS OF THE EUCALYPTS," by Norman Hall. Commonwealth Scientific and Industrial Research Organization (CSIRO), Melbourne, Australia. v + 1-160, figs. 1978. \$7.50.

Sub-titled "Short biographies of people who have named eucalypts, whose names have been given to species or who have collected type material," this brochure is an excellent reference source not only for the biographical materials it contains but also for its listing of *Eucalyptus* taxa showing authorities and dates. This list is not definitive in indicating the validity of the names, since many of these are synonymous at this time. There are two series of alphabetically arranged biographies: (1) people associated with taxa which have been validly published or who are credited with collecting type material; and (2) people associated with species not validly published or where doubt exists as to the material which was collected.

GMH

"FLAVONOLS IN AMMI VISNAGA (L.) Lam.: PRELIMINARY NOTIFICATION," by Branka Akačić and Danica Kuštrak (Fac. Pharm., Zagreb, Yugoslavia). - *Planta Medica* 12 (2): 232-6; 1964.

The following glycosides were identified in leaves and flowers of title plant cultivated in Zagreb: myricetin (I)-3-glycoside (probably I-3-xyloglycoglucuronide); I-3-glycoside (I-3-xyloglucoside or I-3-xylogalactoside); I-3-rhamnoglycoside; quercetin (II)-3-rutinoside (rutin); kaempferol (III)-3-rutinoside; II-3-glycoside (isoquercitrin); III-3-glucoside (astragalín). The following aglycones were identified: I, II, and III. The following sugars were identified: glucose, xylose, rhamnose, glucuronic acid, and rutinose. R_f values are reported for all with 3 different solvent systems. 14 references. (English text).

GMH

"ADVENTURES WITH A MICROSCOPE," by Richard Headstrom. xxiv + 232 pp., 142 figs. Dover Publications, Inc., 180 Varick St., New York 10014. 1977 (1941) \$2.95.

This little book will prove of unending interest to the person, young or old, who is interested in knowing more about his environment. With a microscope and the commonest objects around him, he will discover a multitude of wonderful facts. Although there are only 59 experiments outlined here, this can well be only the beginning of many more similar studies by the interested individual. The late Dr. David G. Fairchild once wrote that the most useful and practical gift for young people was a simple dollar hand lens, a tool which unlocked many unusual pictures of the common things about them. How much more wonderful would be the gift of a compound microscope! This book would itself be a great present for a young person.

G M H

"A BRIEF GUIDE TO SOURCES OF SCIENTIFIC AND TECHNICAL INFORMATION," by Saul Herner. Second Edition. xi + 160 pp., 12 figs. Information Resources Press, 1700 N. Moore St. Arlington, VA. 22209. 1980. \$17.00.

The Preface tells in what ways the technics and tools for obtaining information have changed in ten years since edition one was published. Active in Washington, D.C., the author has unparalleled opportunities to find out there what the best information sources are. The text has a high degree of authenticity and is of genuine value to one who wishes to learn all that may be learned on a certain subject. Each chapter is loaded with the names of books, serials, or services which can supply important data on almost every conceivable subject. The fifth chapter ("Major American libraries and resource collections") is particularly valuable occupying as it does about one-third of the volume. This guide covers the nation from sea to sea: thus it includes the Air University Library at Montgomery, Ala., with 260,000 books; but it does not list Auburn University with over a million volumes. Among abstract journals, Chemical Abstracts, Excerpta Medica, and Biological Abstracts are included, but not Excerpta Botanica (2 sections), which covers the field of botany. This is a most valuable orientation tool for providing all kinds of information. (First edition review: Phytologia 29:419; 1975.)

G M H

"DICTIONARY OF ABBREVIATIONS IN MEDICINE AND THE HEALTH SCIENCES."

Harold K. Hughes. Lexington Books: D.C. Heath & Company, Lexington, Mass. 02173. xxi + 314 pp., 4 tabs.; 1977. \$23.00.

Truly as the compiler says in the preface: "Abbreviations are a way of life for most of us today." It is all very well as long as one knows the meaning but all too often one encounters an abbreviation or acronym which is incomprehensible. It could possibly be a matter of life or death in the case of medication or medical treatment. Hence the particular importance of a volume explaining medical abbreviations for the use of physician, pharmacist, nurse, dentist, veterinarian, et al. The present dictionary gives all indications of being successful in this area—at least for English speaking countries. Over 12,000 entries with some 20,000 meanings are presented. An appendix shows metric prefixes, equivalents of metric and traditional systems of measurement (apothecary and Troy are however not the same), and conversion tables for centigrade and fahrenheit temperatures. The introduction is informative and worth the trouble of reading. (The compiler is a specialist in medical physics). An unusual feature in an abbreviation listing are the entries of words which are neither abbreviations nor acronyms—for instance, kif, kief, yerba, grass, etc., all slang terms for marijuana (Cannabis); King-Kong (barbiturate, etc.); Him (heroin); etc. Although these words are not conventional abbreviations, it may be that such entries could be useful to the user, and could be allowed as coming under the heading of short terms used by addicts in a way similar to that used for regular abbreviations. Single word titles for some journals are also shown: Lancet; Gut; Kidney; etc. Some items not included are: DPS (drug product selection); RT (retention time); CH₂O (carbohydrates); VIS (visual instrumentation sub-system); CC (control center); NYSTATIN (acronyms for "New York ^{State} Institute"); CMT (cancer multistage therapy); DAOM; ACM (adrenocortical mitochondria); BPL (bone phosphate of lime); RRL (regional record librarian); PAMA (phenobarbital/atropine. Mg trisilicate/aluminum hydroxide); PDA (Parenteral Drug Assn.); EOA (Essential Oil Assn.) TGA (Toilet Goods Assn.); sphalm. (L.) (error); s = sym (symmetrical, for organic compounds); u = unsym. (unsymmetrical); cs, (chief of staff; cases); OC (overcounter); v (volume), vv (volumes); CS (Cascara Sagrada); HN₂ (nitrogen mustard); dm³ (liter); IC (intracisternal) etc.² It might have been well to have included abbreviations for important drug houses (e.g., PD (Parke Davis & Co.); SKF (Smith Kline & French); etc. Another important kind of short-hand writing is attained through symbols and at least the important ones might have been included. However, it must be said that this is really an outstanding collection. The reviewer had difficulty in finding abbreviations which were not included. Congratulations to Doctor Hughes!

"DIE KONTROLLIERTE HYPOTENSION MIT NITROPRUSSIDNATRIUM IN DER NEUROANAESTHESIE. ANAESTHESIOLOGY AND RESUSCITATION." K. Huse, Vol. 107: IX + 98 pp., 9 figs., 38 tabs., 1977. Flexible cover, stitched; Springer-Verlag Berlin-Heidelberg-New York. US \$16.80 (+); DM 38.--.

In surgical operations on the brain, reduced blood pressure is considered to give the best results. Various procedures for anesthesia and controlled hypotension as applied to neurosurgery are reviewed. "Neuroleptic" anesthesia (i.e., where there is induced hypnosis and a blockage of autonomic reflexes) is considered the best method, with Fentanyl Janssen and Droperidol Janssen used in combination (in Europe). As hypotensive, sodium nitroprusside (or sodium nitroferrocyanide) has been used for this purpose since 1929 (C.C. Johnson). This combination offers the best management in neurosurgery (brain surgery). The procedure was applied by the author to 25 patients under strict controls of blood pressure, respiration, etc., using as controls 20 patients with neuroleptic anesthesia but not controlled low blood pressure. This clinical trial proved the advantages of sodium nitroprusside for controlled hypotension; but emphasis is placed on the need of adequate controls of the vital functions at the operation site. Adequate background information on all aspects of the subject matter is given. The experimental methods of study are given in full detail. The text is in German with the usual English summary (pp. 74-5) frequently if not always seen in the numbers of this series. The printed pages have been reproduced from typescript and the text is clearly legible. There is an annex with many references (ca 240) and a subject index. The author is associated with the Neurosurgical Clinic of the University of Dusseldorf.

G M H

"PROPAGATE YOUR OWN PLANTS", by Wilma Roberts James and Arla Lippsmeyer. 149 pp., 85 figs., 128 figs., 1 portr. Naturegraph Publishers, Inc., Happy Camp, Calif. 1978. \$4.95 (paper back).

The first 46 pages of this brochure are devoted to general information on propagation and care of plants, while the balance is given over to a consideration of 89 individual plants or plant groups; these are arranged alphabetically in the order of their common names. Besides the information on cultivation and propagation there is a considerable amount of information on the uses and other lore of the plant. This is a useful book for the do-it-yourself gardener.

G M H

"ARCHIVES OF TOXICOLOGY, SUPPLEMENT 1, TOXICOLOGICAL ASPECTS OF FOOD SAFETY," with B. J. Leonard (Editor), Proceedings of the European Society of Toxicology Meeting held in Copenhagen, June 19-22, 1977. c 400 pp., 76 figs. Springer-Verlag Berlin, Heidelberg, New York. 1978. DM 78,--; c \$ US 39.00 (soft cover).

Toxicological aspects of food safety are receiving much attention today by the food industry, various regulatory agencies, and consumers. The meeting covered by these proceedings included many aspects of the evaluation of food, drug, and chemical safety. Topics such as the human clinical experience, pharmacokinetics, metabolism, pathology, reproductive physiology and pathology, carcinogenicity, and mutagenicity were included. Approximately 90 papers were contributed by leading experts from regulatory bodies, universities, contract testing laboratories, and pharmaceutical and chemical laboratories. The proceedings include full length research papers as well as one page abstracts. Two excellent symposia are included dealing with the liver and food safety. Indexes list according to authors and subjects. These proceedings include much up-to-date research information on various aspects of food safety, as well as information on useful and time-saving laboratory procedures. Some helpful information is also presented on comparative pathology and toxicology. In the reviewer's opinion, this volume would be a valuable addition to the personal libraries of toxicologists, pharmacologists, pathologists, environmentalists, food technologists, chemists, and all regulatory personnel responsible for evaluating drugs and chemicals associated with the food industry.

Prof. Samuel T. Coker, Ph. D.
School of Pharmacy, Auburn University
Auburn, AL 36830

"MODERN DRUG ENCYCLOPEDIA AND THERAPEUTIC GUIDE: A COMPENDIUM," Ed. 15. with Arthur J. Lewis (Editor). xxi + 1056 pp. York Medical Books, 666 Fifth Ave., New York, N. Y. 1979. \$38.95 (incl. supplements).

In its several editions, this valuable reference book has been on the market for a long time: in fact, during the reviewer's collegiate life, he used it frequently on many occasions (from the first edition). (For review of ed. 11, see *idem*. 29: 439-40; 1975). As in previous editions, the drugs are arranged by generic name (or else by the proprietary name in the case of multiple combination products) in alphabetic order. These run from Accerelase-PB to Zinc Insulin(s), the latter cross-referenced to Insulins. There is an Addendum with three additional monographs - Cephoxitin Sodium, Cisplatin, and Seractide Acetate. These three are not cross-referenced in the main body of the text but of course would be picked up through the index which is the usual and best way for finding an item. Actually, there are three indexes - the general index (used to locate a particular medicinal); the therapeutic index (furnishing the names of agents designed for the treatment of the various indications); and the manufacturers' index (names and addresses, followed by a list of the company products covered in this book. Marginal markings help to locate these indexes. The early part of the book before the systematic

listing of "pharmaceuticals and biologicals" has useful information on technical proprietary terms (such as "Disket (Lilly); inscribed tablet"); drug and chemical blood level data; and a brief review of the activities of the Drug Enforcement Administration (DEA), now so directly involved with the availability and control of many medicinal agents. All controlled items in the listing are marked C-II to C-V. Previous editions of this reference book lumped closely related medicinals together into distinctive groups. There are now ten of these: Adrenal corticosteroids; cephalosporins; erythromycins; estrogens; fluoride-vitamins; insulins; penicillins; phenothiazines; sulfonamides (antibacterial); and thiazide diuretics. Repeated editions of this work have achieved a totality approaching perfection; however, changes in composition, indications, dispensing forms, etc., regularly occur as a rule and these are noted in the serial publication, Modern Drugs, received regularly by the purchaser. A very useful supplement to the main work might be a listing of products deleted from the previous edition, with the reason(s) for discontinuance. A case in point is Meratran (Merrell), generically Propranolol, which would appear to be a useful psychic stimulant, especially for the aged and for chronic invalids. Why was it discontinued? Many a pharmacist and physician have often wondered no doubt. With this reference work, sufficient information is given on each product that it is ordinarily not necessary to search elsewhere for more information. Physicians, pharmacists, and other health professionals will find it a most valuable tool.

GMH

"PRACTICAL FOLK MEDICINE OF HAWAII." by L. R. McBride. 104 pp., 84 figs. Petroglyph Press, Hilo, Hawaii. (Paper back). 1975. \$4.50.

This semi-popular book deals with the plant (chiefly), animal, and mineral remedies of popular Hawaiian medicine. The first section tells something about the collection and preparation of plant materials, the second is a systematic consideration of various plants, etc., arranged by their Hawaiian common names, and the last section reviews various miscellaneous technics for the relief of many common complaints and diseases, as practiced in Hawaii.

GMH

"MICROBIOLOGY OF COOLING WATER," by James W. McCoy. xi + 1-249, 18 figs., 39 tabs. Chemical Publishing Co., New York, N. Y. 1980. \$30.00.

The chief objective of this title is to provide basic and specific modes of establishing and maintaining microbiological control in recirculating cooling systems, such as are found in nuclear plants, chemical factories, etc. The action mechanism of various biocides used to destroy algae, bacteria, fungi, and possibly higher plants and some of the lower animals (Protozoa chiefly) are detailed and suggestions given for applying such toxicants in the most efficient and economic way. Emphasis is placed on preserving the environmental status as far as possible. While the price for this small book may appear to be high, it actually will represent a genuine economy if put into practice at the cooling system, since practi-

cal and detailed procedures are given for determining microbiological debris, for estimating degree of infestation of a cooling system, and for finding the effectiveness of the microbiocide in use. Such specific information is not readily available in books on the market, it is said, and this book will thus provide a direct means of cutting costs to provide water which can be re-utilized or recycled. An introductory section lists the plant genera which are found in contaminated cooling waters and classifies them into various of the larger groups. The elements of classification and structure and the metabolism and growth are presented to give a better idea of form and function. This text supplements an earlier one of the authors: "The chemical treatment of cooling water," 1974. (See review in Quarterly Journal of Crude Drug Research, 14: 45; 1976).

GMH

"HORTUS BOTANICUS: THE BOTANICAL GARDEN AND THE BOOK," with I. MacPhail (compiler). "50 books from the Sterling Morton Library exhibited at the Newberry Library for the 50th Anniversary of The Morton Arboretum. Morton Arboretum, Lisle, Illinois. 120 pp., 39 figs., 4 pls. (col.). 1972. \$4.50.

This represents a catalog covering books mostly in the chronological order of publication date (from No. 1 Porro's *Horto de'semplici di Padova* (1591) to No. 50, Sargent's *Silva* (1891 to 1902). Bibliographic data are given with brief pithy biographic descriptive texts. There is an introductory chapter by J. Ewan ("The botanic garden and the book") written in his customary interesting style, and a terminal list of notable botanic gardens with date of establishment. The price of this attractive card-bound volume is modest indeed.

GMH

THE RARE VASCULAR PLANTS OF NOVA SCOTIA," by R. V. Maher, D.J. White, G. W. Argus, and P. A. Keddy. *Syllogeus* No. 18: 1-38, 1 fig.; 1977. (With French version bound in on opposite side: 1-39; 1977).

Listing in alphabetic order of generic names of ca. 200 taxa with annotations (references; range; habitat; map; status; protection; etc.). At the back Bibliography and a listing of the same plants in taxonomic (Englerian) order.

THE PRESENT IS THE ELEVENTH COLLECTION OF BOOK REVIEWS BY G. M. HOCKING TO BE PUBLISHED IN PHYTOLOGIA. SOME OF THE EARLIER CONTRIBUTIONS WERE SUPPORTED BY FACULTY GRANTS-IN-AID OF AUBURN UNIVERSITY (AUBURN, ALABAMA), FOR WHICH THE REVIEWER IS GRATEFUL.

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EPISCOTHAMNUS AND BISHOPALEA, TWO NEW GENERA OF VERNONIEAE

(ASTERACEAE) FROM BRASIL, AND THE RESURRECTION OF

SIPOLISIA.

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Recent material from Brasil collected by R. M. King and L. E. Bishop includes specimens of two additional undescribed genera of the Vernoniaeae. The new genera, *Episcothammus* and *Bishopalea*, are both named in honor of the second collector, Luther Earl Bishop. The study also has resulted in the redelimitation of *Proteopsis*, the resurrection of *Sipolisia*, and new synonymy in *Aleantara* and *Heterocoma*. The genera are considered in the above order.

EPISCOTHAMNUS H. Robinson, genus nov. Asteracearum (Vernoniaeae, Lychnophorinae).

Plantae fruticulosae candelabrifformes 1½ m altae. Caules et rami 5-10 mm lati dense albo-tomentosi. Folia dense spiraliter inserta sessilia anguste oblonga vel linearia plerumque 25-160 mm longa et 4-10 mm lata distaliter minores base non vel leniter constricta margine anguste valde revoluta apice anguste acuta saepe pungentiter breviter acuminata supra leniter vel non rugulosa glabra subtus appresse albo-lanata, nervis secundariis pinnatis brevibus ca. 45° ascendentibus. Inflorescentiae spiciformes dense breviter foliosae in diametro ca. 4 cm. Capitula in axillis foliorum campanulata 20-25 mm alta et 12-15 mm lata; bractaeae involucri exteriores ca. 30 subimbricatae ca. 4-seriatae anguste lanceolatae 6-14 mm longae et ad 1.5-2.0 mm latae dense lanatae erecto-subappressae apice breviter aristatae glabrae; bractaeae interiores ca. 30 ca. 2-seriatae vix deciduae lineares 15-16 mm longae et ca. 2 mm latae inferne glabrae apice anguste acutae leniter vel valde reflexae dense lanatae; receptacula glabra epaleacea concava. Flores ca. 23 in capitulo uniformes; corollae lavandulae 13-14 mm longae infundibulares, tubis angustis ca. 4 mm longis glabris, faucibus 1.5-2.0 mm longis glabris, lobis linearibus anguste acutis 7-8 mm longis et ad 0.7-0.8 mm latis superne sensim minute glandulo-puberulis et sparse setiferis, setis biformibus elongatis incrassatis et aliquantum contortis appressis et setis brevioribus in apices obtusis in parietibus tenuibus; filamenta in parte superiore ca. 0.3 mm longa, cellulis plerumque breviter oblongis in parietibus leniter incrassatis; thecae ca. 4.5 mm longae base non appendiculatae,

cellulis endothecialibus mediis laxioribus irregulariter ornatis ad 30 μ m longis; appendices antherarum ca. 2 mm longae lanceolatae anguste acutae induratae; basi stylorum non noduliferi; scapi stylorum in parte superiore setuliferi ca. 5 mm longi, rami stylorum ca. 2.5 mm longi attenuati. Achaenia ca. 5 mm longa et 1.5 mm lata prismatica ca. 10-costata glabra basi truncata; carpodia late obturaculiformia ca. 0.4 mm longa et 1 mm lata, cellulis breviter oblongis ca. 8-10-seriatis ca. 12-15 μ m longis in parietibus regulariter mediocriter incrassatis; pappus biseriatus; seriebus exterioribus squamiformibus ca. 12 variis, squamis interdum 1 mm longis ovatis et multo denticulatis aliquantum deciduis interdum 2-4 mm longis lanceolatis in apicem paucis denticulatis base in parte breviter connatis persistentibus, seriebus interiores perfacile deciduis, setis anguste taeniatis plerumque 10-11 mm longis leniter spiraliter contortis margine minute scabridulis. Grana pollinis sphaerica vel leniter oblonga ca. 60 μ m alta et in diametro ca. 50 μ m.

Type species: *Lychnophora candelabrum* Sch.Bip.

The genus contains only one species.

EPISCOTHAMNUS CANDELABRUM (Sch.Bip.) H.Robinson, comb. nov.

Lychnophora candelabrum Sch.Bip., Pollichia 20-21: 345.

1863. The species name is treated as a noun in apposition and is not declined. The name was redundant in *Lychnophora*. The new collection is here designated as neotype. BRASIL: MINAS GERAIS: 62 km along road SW of Diamantina toward Curvelo. Elev. 3600 ft. occasional. 1½ meter tall, flowers lavender. Jan. 20, 1981. R.M.King & L.E.Bishop 8573 (Neoholotype, UB; isotype, US).

The neotype is a perfect match with the type photograph of the destroyed Sello type which was deposited in the Berlin Herbarium. The original specimen was a sterile unicate (Schultz, 1863), and was placed in the genus *Lychnophora* on the basis of the large branching habit and the densely spirally inserted leaves. The species is distinctive in the narrowly elliptical, finely pointed, abaxially white leaves, those of other *Lychnophora* species being blunt to short-acute. The new specimen shows fertile features which are sufficient to exclude the species from *Lychnophora*.

The new genus is evidently related to *Lychnophora* where the species was placed by Schultz (1863). The most distinctive feature is the form of the inflorescence with an elongate axis and large heads containing 20-25 flowers. The heads of the short spiciform inflorescence, because of the elongate axis, are scarcely contiguous, and the appearance is completely different from the short, condensed, compound head seen in *Lychnophora*. The pollen of the new genus is also somewhat distinctive in its larger size and slight tendency toward an oblong shape. The pollen in *Lychnophora* is about 40 μ m in diameter and spherical to slightly oblate. *Episcothamnus candelabrum* can also be distinguished from any known species of *Lychnophora* by the narrowly

pointed tips of the leaves. *Episcothammus* has unusually large and indurate anther appendages for a member of the Vernoniaceae. In this respect the genus approaches the Mutisieae. Appendages of the genus *Lychnophora* are not as large or as indurate, but they are nearly as large in relation to the size of the anther thecae.

The new genus also might be closely related to *Lychnophoropsis* as the latter is described, but the latter has only about 10-15 flowers with a central supposedly sterile villous achene in each head.

A further feature of interest is evident in the cylindrical inflorescence of *Episcothammus*. In most Asteraceae, the inflorescence is notably cymose, a fact emphasized in such genera as *Liatris* of the Eupatorieae with a spiciform inflorescence first maturing at the apex. The cymose nature of the Vernoniaceae is particularly marked, and has been noted even in *V. eitenii* with a rather simple inflorescence (Robinson, 1980). In *Episcothammus*, the lower heads of the spiciform inflorescence mature first, in complete violation of the normal cymose condition in the family. The exception seems to be common in the subtribe Lychnophorinae where the peripheral heads in the inflorescences of *Lychnophora* and *Chresta* often mature first. This order of maturation is best developed in *Pithecozeris* with its simple *Dipsacus*-like inflorescence which continues to grow above as it fruits below. *Eremanthus* is notable for the simultaneous maturation of all the heads in each clustered inflorescence. Even the latter condition is a departure from the normal order of maturation in the family, and the character tends to reinforce the already recognized distinction of the subtribe Lychnophorinae.

BISHOPALEA ERECTA H. Robinson, genus et sp. nov. Asteracearum (Vernoniaceae, Vernoniinae).

Plantae erectae 1.5-5.0 m altae in parte vegetativo non ramosae. Caules in diametro 3-5 cm dense albo-lanati. Folia laxae vel interdum dense spiraliter inserta sessilia oblongo-elliptica plerumque 6-24 cm longa et 2.5-9.0 cm lata base auriculata et amplexicaulia margine minute crenulata vel subintegra apice breviter acuta supra flavo-viridia dense velutina, pilis in areolis minutis polygonalibus orietatis, subtus dense albo-lanato-tomentosa, nervis secundariis pinnatis utrinque 10-17 patentibus et leniter arcuate ascendentibus. Inflorescentiae in ramis brevibus deciduis late subdense corymboso-cymosae pauci-capitatae, ramis ultimis 5-10 mm longis dense lanatis, bracteis subinvolucralibus paucis foliosis 0.7-2.5 cm longis. Capitula late campanulata 13-15 mm alta et ca. 15 mm lata; bracteae involucri 30-35 ca. 4-seriatae ovato-lanceolatae vel lineares 4-10 mm longae et 1-2 mm latae apice acutae vel pungentes extus et margine dense tomentosae; receptacula paleacea, paleis linearibus 10-11 mm longis persistentibus inferne anguste

subulatis superne subtiliter anguste fusiformibus in parte sub-apice tomentosis. Flores ca. 20 in capitulo uniformes; corollae lavandulae 9-10 mm longae cylindricae extus praeter apicem glabrae, tubis ca. 0.7 mm longis, faucibus ca. 1 mm longis, lobis linearibus 7-8 mm longis et 0.6 mm latis distaliter tomentosopilosis; filamenta in parte superiore ca. 0.45 mm longa, cellulis oblongis in parietibus leniter incrassatis; thecae antherarum 3.5 mm longae base breviter appendiculatae, cellulis endothezialibus uniformibus irregulariter polygonalibus in diametro 12-20 μ m in parietibus paulum incrassatis; appendices antherarum ca. 0.8 mm longae ovato-lanceolatae apice anguste acutae vel vix acuminateae vix induratae; basi stylorum non noduliferi; scapi stylorum in parte superiore setuliferi ca. 1.5 mm longi; rami stylorum ca. 3.5 mm longi attenuati. Achaenia ca. 5 mm longa et 1.0-1.5 mm lata prismatica ca. 10-costata glabra base truncata; carpopodia indistincta 1 mm lata margine incurvata, cellulis marginalibus et supra-marginalibus subquadratis in diametro ca. 12 μ m superne sensim majoribus; pappus uniformis setiformis, setis perfacile deciduis numerosis ca. 8 mm longis scabridulis. Grana pollinis sphaerica in diametro ca. 40 μ m (*Lychnophora*-type).

TYPE: BRASIL: Bahia: Main valley north of Mucugê from 3-8 km north of town. Elev. 2600-3000 ft. In bare rocky areas. Locally common plants with single erect woody stem 3-5 cm in diameter 1.5-5 meters tall, the short fertile branches deciduous soon after fruiting, flowers lavender. January 31, 1981. R. M. King & L. E. Bishop 8729 (Holotype, UB; isotype US).

Bishopalea is distinguished within the tribe by the combination of the paleaceous receptacles and the cymose branching inflorescences. The cylindrical corolla with its short basal tube and throat seems unique in the tribe. The pubescence on the upper surface of the leaves is also unique in its details, having the velvet oriented so that the hairs diverge along the veins. The resulting appearance shows the polygonal areoles as though they were bullate, in spite of the fact that the upper leaf surface is actually flat. The form of the pubescence, inflorescence, and corollas all contrast strongly with those of *Heterosoma*, the other Brazilian genus of the Vernoniaceae having fully developed paleae on the receptacle.

The search for relatives of *Bishopalea* has ultimately led to examination of the genus *Proteopsis* for which five species have been described in Brasil. The type species, *P. argentea* Mart. & Zucc. ex Sch.Bip., has appressed argenteous pubescence, clustered heads at the top of a stalk with decrescent leaves, involucre bracts with long stiff acuminate awn-tips, and an epaleaceous receptacle. The species is not considered a close relative of *Bishopalea*, but other species that have been placed in the genus are very different.

Of the five species in *Proteopsis*, three were added by Philipson (1938), two described as new and one transferred. The transferred species was originally described as *Sipolisia*

lanuginosa Glaziou ex Oliv., is a species with heads clustered as in typical *Proteopsis*, but with stem leaves and pubescence most like *Bishopalea*. Philipson stated that *Sipolisia* differed in no essential characters from *Proteopsis*, but he overlooked the presence of long palea-like projections from the receptacle of the former. On the basis of the receptacle, the lanate pubescence of the stem, the lanceolate rather than acuminate involucral bracts, and the densely hairy tips of the corolla lobes, *Sipolisia* Glaziou ex Oliv. is here restored to the status of a monotypic genus. Relationship of *Sipolisia* is closer to *Bishopalea* than *Proteopsis*, but the former remains distinct by the fully formed paleae, the cylindrical corollas with short basal tubes, the branching lateral inflorescences, and the lanate short-aristate involucral bracts.

Philipson (1938) described a new species, *Proteopsis ekmaniana*, which he stated Ekman had determined as a new species of *Sipolisia*. Certainly, the Philipson species is close to *Sipolisia* with lanate pubescence, hairy tips on the corolla lobes, and almost identical long palea-like projections from the receptacle. The species differs, however, in the leaves with broadened imbricated sheathing bases and long narrow petioles, by the long-pedunculate axillary inflorescences, and by the extremely large paired foliose bracts subtending the heads. The Philipson species was based on *Glaziou 21668* (Kew) while the same species has been described more recently as *Alcantara petroana* Glaz. ex Barroso based on *Glaziou 21667* (Barroso, 1969). The separate generic status given by Barroso is here regarded as appropriate, but the Philipson species name has priority, necessitating the following new combination.

ALCANTARA EKMANIANA (Philipson) H. Robinson, comb. nov.

Proteopsis ekmaniana Philipson, Kew, Bull. Misc. Inform. 1938 (7): 300. 1938.

One other species, *Proteopsis sellowii* Sch. Bip., proves not to belong to *Proteopsis*. Two specimens, *Ule 2607* and *Irwin, Harley & Onishi 28979*, both from Minas Gerais, Brasil, have been seen and compare perfectly with a type photograph of *P. sellowii*. However, the two specimens prove to have true paleae in the heads, and they match the characters (Baker, 1873) and illustration (Toledo, 1941) of *Heterocoma albidia* DC. The Schultz-Bipontinus species is here regarded as a synonym of the earlier de Candolle species.

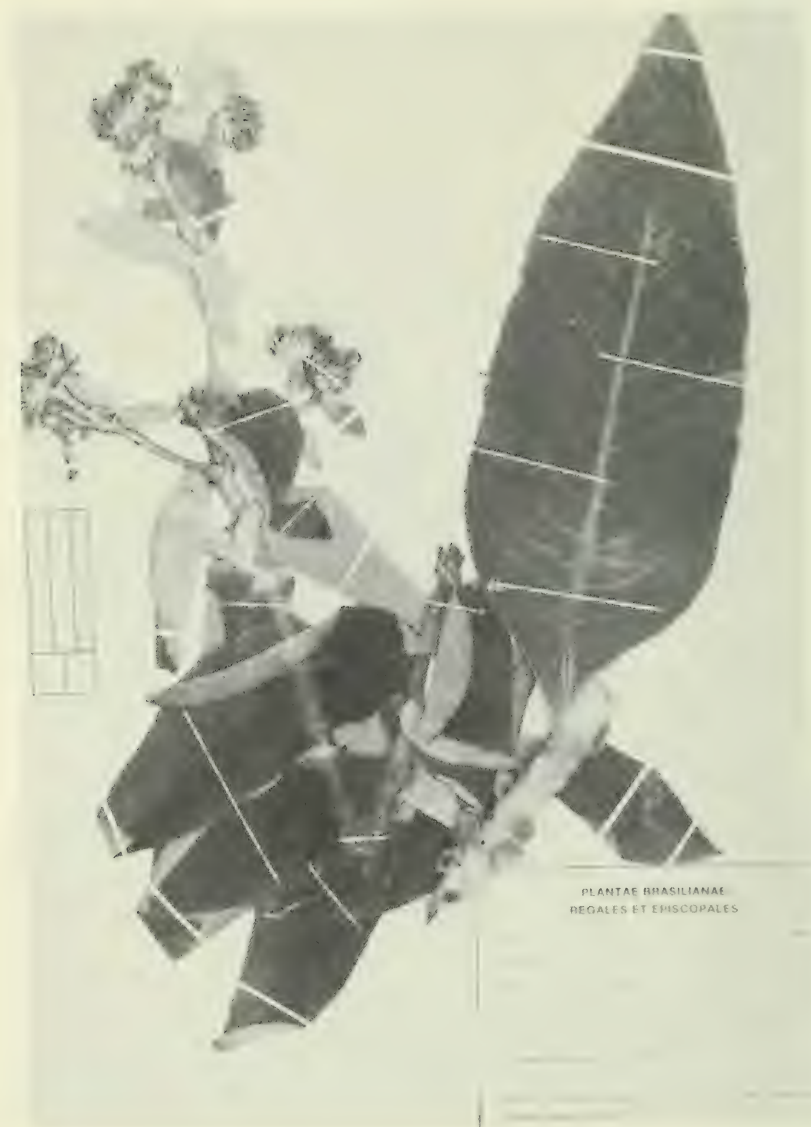
There remains only one other species that has been placed in *Proteopsis*, *P. insculpta* Philipson, based on *Glaziou 14974* (Kew) cited from the environs of Rio de Janeiro and D'Ouro Preto. The species is said to closely resemble *P. argentea* in its leaves and tomentum, but to differ in its more woody and branched stems, and its involucral bracts which lack spreading spines. The type should be re-examined in view of present concepts.

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Episcotammus candelabrum (Sch.Bip.) H.Robinson, Neotype,
Herbário Universidade de Brasília. Photos by Victor E. Krantz,
Staff Photographer, National Museum of Natural History.



Bishopalea erecta H. Robinson, Holotype, Herbário Universidade de Brasília.



Enlargements of heads. Top: *Episcothammus candelabrum*.
Bottom: *Bishopalea erecta*.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCIII.

A NEW GENUS *BISHOPIELLA*.

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A generic survey of the tribe Eupatorieae continues to be complicated by the discovery of previously unknown genera from the American Tropics. Within the period since our attempt to complete the descriptions of all new genera, another distinctive novelty has been collected in Bahia, Brasil, by the senior author and L. E. Bishop. The genus is named here for the latter collector.

The new genus is a member of the subtribe Gyptidinae of the Eupatorieae that is represented by approximately 20 genera in Brasil. The eximbricate involucre, the conical receptacle, the densely papillose surface of the stylar appendage, and the strongly annulate ornamentation of the anther collar are all common features in the subtribe. *Bishopiella* is utterly distinct in the subtribe by the rosulate habit with an erect scapose inflorescence. Such a habit is more common in the Eupatorieae in the subtribe Liatrinae of the Southeastern United States, but is almost unknown in other subtribes. The scars on the conical receptacle of *Bishopiella* are large with narrow recessed interstices, similar to those of the generic group including *Barrosoa*, *Dasycondylus* and *Conocliniopsis*. The new genus differs from the first and second of these by the small carpodium and densely setose achene, and from the second by the glabrous unenlarged base of the style. It is possible that the closest relationship of *Bishopiella* is to the widespread, shrubby, monotypic *Conocliniopsis*.

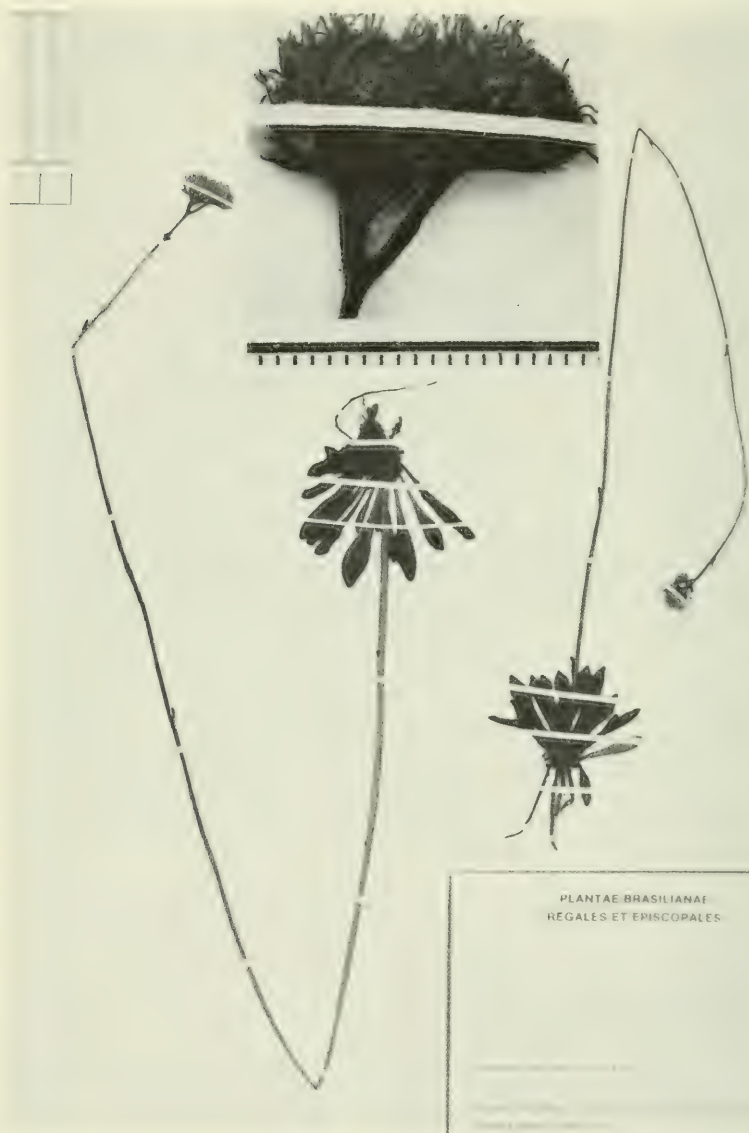
BISHOPIELLA ELEGANS R. M. King & H. Robinson, gen. et sp. nov.

Asteracearum (Eupatorieae).

Plantae rosulatae acaulescentes. Folia carnosa oblanceolata 2-4 cm longa et 0.3-0.9 cm lata base cuneata margine intergra apice anguste obtusa utrinque glabra trinervata, nervis secundariis valde ascendentibus obscuris. Inflorescentiae longe scaposae apice dense cymosae paucae ramosae, scapis 40-50 cm altis pallide brunnescentes leniter striatis inferne glabris superne sensim dense puberulis, bracteis scaporum remotis minutis 4-8 mm longis et 0.5-1.5 mm latis, ramis ultimis brevibus 2-7 mm longis dense puberulis. Capitula late campanulata 7-8 mm alta et 7-10 mm lata; squamae involucri fusco-virides subcarnosae eximbricatae ca. 2-seriatae lineari-lanceolatae ca. 4 mm longae et ad 1 mm

latae apice acutae extus inferne leniter bicostatae superne sparse puberulae; receptacula alte conica glabra distincte maculata in intersticibus insculpta. Flores ca. 40-50; corollae albae late infundibulares, tubis ca. 1 mm longis e basis sensim latioribus, faucibus ca. 2 mm longis extus sparse minute breviter glanduliferis, lobis ca. 1 mm longis et 0.8-1.0 mm latis ovato-triangularibus intus valde mamillosis extus superne et margine dense leniter papillosis extus aliter multo breviter glanduliferis; filamenta in parte superiore 0.15-0.20 mm longa, cellulis plerumque subquadratis vel breviter oblongis in parietibus valde transverse annulate ornatis; thecae ca. 1.3 mm longae; appendices antherarum ca. 0.15 mm longae et 0.30-0.35 mm latae apice truncatae; basi stylorum glabri non noduliferi; rami stylorum late lineares vel breviter taeniformes mamillosi apice sensim laeves. Achaenia breviter prismatica ca. 2 mm longa 5-costata inferne sensim paulum angustiora dense setifera inferne et in costis densiores inter costas persparse minute glandulifera; carpodia anguste annuliformia leniter prominula, cellulis 2-3-seriatis plerumque subquadratis ca. 20 μ m latis in parietibus aliquantum tenuibus; setae pappi ca. 35 plerumque 1.5-3.0 mm longae inferne margine subplumosae apice angustiores sensim sublaeves, cellulis apicalibus argute acutis. Grana pollinis in diametro 25-28 μ m.

TYPE: BRASIL: Bahia: Vicinity of Pico das Almas, ca. 20 km NW of the town of Rio das Contas. Elev. 3500-4600 ft. Herb in boggy marsh, flowers white. Jan. 25, 1981. *R.M. King & L.E. Bishop 8645* (Holotype, UB; isotype, US).



Bishopiella elegans R. M. King & H. Robinson, Holotype, Herbário Universidade de Brasília. Photos by Victor E. Krantz, Staff Photographer, Staff Photographer, National Museum of Natural History.

STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCIV.

NEW COMBINATIONS IN BRASILIAN AND MEXICAN SPECIES

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Numerous undescribed species of Eupatorieae have been encountered by the authors, and efforts have been made to describe some of these for inclusion in a nomenclator of the tribe when they involve important elements of the genera to which they belong. Description of many isolated species, however, have been deferred until later. Still, there remains the need to reassign a few species that have been described by other authors (Soares Nunes, 1981; Turner, 1977, 1978).

ACRITOPAPPUS CONNATIFOLIUS (Soares Nunes) R.M.King & H.Robinson, comb. nov. *Ageratum connatifolium* Soares Nunes, Bradea 3 (18): 130. 1981.

The species was described on the basis of *Mori & Benton 13227* from Municipio de Palmeiras, Bahia, Brasil. A second specimen from the same locality has been seen, *Mori 13311* (US). The species is distinguished from other members of the genus by the connate paired leaf-bases after which the species is named.

AGERATINA FLOURENSIFOLIA (Turner) R.M.King & H.Robinson, comb. nov. *Eupatorium flourensifolium* B.L.Turner, Wrightia 5 (9): 353. 1977.

The species seems to be related to the widespread *Ageratina ligustrina* (DC.) K.& R., but differs by the shorter internodes, the generally narrower leaf blades, the more sharply serrate leaf margins, the more viscid leaf surfaces, and the lack of a sharp delimitation at the base of the leaf blades.

PHANEROSTYLIS NESOMII (Turner) R.M.King & H.Robinson, comb. nov. *Brickellia nesomii* B.L.Turner, Brittonia 30 (3): 342. 1978.

The relationship of the species was recognized by Turner (1978), but the natural concept of *Phanerostylis* was dissected by that author between two separate genera, *Brickellia* and *Barroetea*, and the genus *Brickellia* was broadened in a way that left only the chromosome number as a distinction from *Eupatorium* and no essential distinction from *Barroetea*. We here restore a sane concept to *Phanerostylis*, and recognize four species in the genus.

The *Phanerostylis* is one of two described recently by Turner from the area of Cerro Pene Nevada in Nuevo Leon, Mexico.

Another specimen seen in this study is from farther west in the Sierra Catorce in San Luis Potosí (Pennell 17529, US). The other species from Pena Nevada, *Ageratina miquihuana* (Turner) K. & R., proves to include *Eupatorium astillerum* described by Turner (1977) in the same paper from the Sierra de Astillero in Zacatecas, Mexico (King & Robinson, 1977).

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STUDIES IN THE EUPATORIEAE (ASTERACEAE). CCV.

TWO NEW SPECIES OF *MIKANIA* FROM BRASIL.

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In a recent study (King & Robinson, 1980) eight new species of *Mikania* were described from Brasil. Two additional new species have been encountered since, and they are described below.

MIKANIA BISHOPII R. M. King & H. Robinson, sp. nov.

Plantae volubiles subglabrae. Caules fistulosi anguste 6-alati interdum spiralliter contorti minute sparse puberuli. Folia opposita, petiolis 1-2 cm longis anguste alatis; laminae ovatae vel oblongo-ovatae plerumque 6-10 cm longae et ca. 1.5-4.0 cm latae base rotundatae trinervatae vel tenuiter quinquenervatae margine integrae apice breviter anguste acuminatae supra et subtus glabrae non glanduliferae in nervis majoribus subtus perminute sparse puberulae, nervis tertialibus aliquantum regulariter transversalibus. Inflorescentiae thyrsoido-paniculatae in ramis terminales vel axillares, ramis ultimis brevibus sparse puberulis vel subpilis. Capitula in glomerulis paucicapitatis dense aggregata sessilia cylindrica ca. 7 mm alta et ca. 2 mm lata; bracteae subinvolucrales breviter lineares vel anguste oblongae ca. 2 mm longae et 0.4-0.7 mm latae glabrae vel subglabrae; bracteae involucri lineares vel anguste oblongae 5.5-6.0 mm longae ca. 1 mm latae base leniter gibbosae extus plerumque glabrae apice sensim minute puberulae obtusae. Corollae albae ca. 5 mm longae, tubis angustis ca. 2 mm longis glabris; faucibus anguste infundibularibus ca. 2.3 mm longis glabris, lobis breviter triangularibus ca. 0.9 mm longis et 0.7 mm latis margine dense puberulo-fimbriatis extus superne sparse puberulis intus superne sparse vel dense puberulis, pilis 1-3-septatis; filamenta in parte superiore anguste ca. 0.4 mm longa; thecae antherarum ca. 1 mm longae leniter fulvescentes; appendices antherarum ca. 0.3 mm longae et 0.18 mm latae; basi stylorum leniter incrassati glabri; rami stylorum lineares obtusi dense breviter papilloso. Achaenia prismatica ca. 2.8 mm longa 5-costata inferne glabra superne sparse puberula apice dense puberula; setae pappi ca. 40 uniseriatae plerumque 3.5-4.5 mm longae superne non latiores, cellulis apicalibus acutis. Grana pollinis in diametro 20-22 μ m.

TYPE: BRASIL: Goias: 5 km NE to 5 km NW of Crystallina. elev. 2800-3200 ft. Vine in trees along creek, flowers white. Feb. 14, 1981. R.M.King & L.E.Bishop 8967 (Holotype, UB; isotype, US).

The most distinctive features of *Mikania bishoppii* are the wings on the stem and petioles and the hairs of the corolla lobes. The wings are narrow, but are particularly noticeable on twisted stems. The hairs on the corolla lobes are more prominent than any seen in other members of the genus, and they extend extensively onto the inner surface of the lobe. *Mikania smilacina* DC. has a similar habit, but wings are absent, the leaves are firmer with distinctly prominulous veins, the clusters of the inflorescence are denser, the corolla lobes have very few short hairs, and the tips of the pappus setae are broadened. The winged petioles of the new species recall *M. pteropoda*, but the latter has unwinged stems, non-acuminate more strongly trinervate leaves with serrulate margins, uncondensed racemose segments in the inflorescence, smaller heads with shorter corollas, hairless corolla lobes, and slightly broadened blunt tips on the pappus setae. Actual relationship of the new species may be closer to *M. glomerata* Spreng. and the questionably distinct *M. hookeriana* DC. which have no wings and only short marginal hairs on the corolla lobes.

MIKANIA KUBITZKII R. M. King & H. Robinson, sp. nov.

Plantae volubiles. Caules fistulosi teretes striati glabri. Folia opposita, petiolis angustis 1.0-3.5 cm longis; laminae ovatae vel oblongo-lanceolatae 4-14 cm longae at 1.5-5.5 cm latae base obtusae vel breviter acutae margine integrae apice argute breviter acuminatae utrinque glabrae fere ad basem valde trinervatae. Inflorescentiae generaliter laxae thyrsoidae-paniculatae in ramis pyramidaliter paniculatae sensim racemosae in nodis primariis vix alatae et plexi-ramosae, ramis minute sparse contorte puberulis, pedicellis 1-3 mm longis, bracteis subinvolucralibus basaliter insertis ca. 2 mm longis linearibus. Capitula cylindrica 6-8 mm alta et 1.5-2.0 mm lata; bractee involucri oblongo-ellipticae ca. 6 mm longae et 1.5 mm latae apice rotundatae extus sparse perminute puberulae. Corollae albae? ca. 5 mm longae, tubis angustis 2.5 mm longis extus variabiliter glandulopunctatis; faucibus anguste infundibularibus ca. 1.5 mm longis glabris, lobis oblongo-lanceolatis ca. 1 mm longis et 0.4 mm latis extus superne glandulopunctatis margine irregulariter breviter papillosis; filamenta in parte superiore angusta ca. 0.35 mm longa; thecae antherarum ca. 0.8 mm longae virides in parietibus transversalibus et verticalibus cellularum late incrassatae; appendices antherarum subquadratae ca. 0.2 mm longae et latae apice rotundatae; scapi stylorum angusti glabri; rami stylorum in partibus stigmataceis et appendicibus inferioribus abaxialiter glandulopunctati, appendicibus sensim angustioribus dense breviter papillosis. Achaenia prismatica ca. 3 mm longa 5-costata sparse minute puberula; setae pappi ca. 40 plerumque ca. 4.5 mm longae apice distincte leniter latiores, cellulis apicalibus obtusis. Grana pollinis in diametro 20-22 μ m.

TYPE: BRASIL: Bahia: Município de Una. Estrada que liga BR 101 (São José) com BA 265, a 17 km da primeira. Cerca de 35 km ao S de Itabuna. Região de Mata Higrófila Sul Baiana. Cipó. Sept. 27, 1979. S.A.Mori, T.S.dos Santos, K.Kubitzki & H.Poppendieck 12825 (Holotype, CEPEC; isotype, US).

Mikania kubitzkii seems most closely related to *M. thyrsoides* Baker which occurs farther south in southern Minas Gerais to Paraná, but the latter has smaller sessile heads and less well-developed nodal complexes in the inflorescence. Both *M. firmula* Baker and *M. duckei* Barroso from Bahia and Pernambuco are similar to the new species, but both also have sessile heads and the inflorescences have extensive spicate-racemose segments. All the above species, as well as the recently described *M. hagei* K. & R., have glands on the outer surface of the style branches, but only the new species has the appendages so reduced and tapering in comparison to the broad stigmatic region. The new species seems unique in the slightly winged nodal complexes formed at the primary nodes of the inflorescence where the first catadromous tertiary branch arises at the base of the secondary branch in an apparent 5-way branching. The branching pattern is weakly developed without any trace of a wing in *M. thyrsoides*.

Literature Cited

- King, R. M. and H. Robinson 1980. Studies in the Eupatorieae (Asteraceae). CLXXXVIII. New species of *Mikania* from Brasil. *Phytologia* 45 (2): 124-141.



Mikania bishopii R. M. King & H. Robinson, Holotype,
Herbário Universidade de Brasília. Photos by Victor E. Krantz,
Staff Photographer, National Museum of Natural History.



Mikania kubitzkii R. M. King & H. Robinson, Isotype, United States National Herbarium.



Top: *Mikania bishopii* enlargement of heads. Middle and Bottom: *M. kubitzkii* node of inflorescence and enlargements of heads.

TWO NEW TUBER-BEARING SOLANUM FROM SOUTH AMERICA

by C.M. Ochoa*

SOLANUM INCASICUM Ochoa sp. nov.

Herbaceum, tuberiferum. Plantae validae 50-60 cm altae, caules simplici vel valde ramificati, 8 mm crassi, pilis albis 4 mm vel plus longis dense obsiti, caules alati, alae rectae, angustae, laete virides, caules profunde pigmentati, praecipue 1/3 supra basim, internodia 1.5-3.0-4 cm longa. Stolones albi, carnosii, 2 mm crassi, 70-80 cm longi; tubera alba, rotundata usque ad ovalia, 1-3 cm longa. Folia imparipinnata, valde dissecta, 6.5-12.0 x 4.5-9.7 cm, dense pilosa, plerumque 4-juga; foliola interjecta valde inaequalia, numerosa. Petioli 5-10 mm longi, eodem modo quo rhachis et petioluli pilis densissime praediti. Foliola anguste elliptico-lanceolata vel elliptico-lanceolata, pilis albis argenteis obsita et in marginibus sinuosi atque crenati. Foliolum terminale lateralibus paulo majus, 3.3-5.5 x 2.0-3.0 cm, apex acutus vel subacuminatus basi rotundatum. Foliola lateralibus apice acuta vel subobtusata, basi oblique rotundata, subsessilia vel petiolulis brevioribus praedita. Foliola primi jugis 2.2-5.0 x 1.0-2.0 cm, alia foliola ad basim gradatim minora. Foliola interjecta orbicularia et late elliptico-lanceolata, membranacea, sessilia, 1.0-0.6 mm longa. Foliola pseudostipulacea 5-7 mm longa, 3-4 mm lata, anguste elliptico-lanceolata, vel fere falcata. Inflorescentia cymosa vel cymoso-paniculata, 10-12-flora, pedunculi 5-8 cm longi, basi usque ad 2.5 mm crassi, dense pilosi tamquam pedicelli et calyx, pedicelli 1/3 supra articulati, pedicellus superior 7-8 mm longus, inferior 25-30 mm longus. Calyx 10-11 mm longus, subpigmentatus vel pigmentatus, lobi anguste lanceolati, late membranacei, acumina acuta, 3-4 mm longa. Corolla magna rotata, usque ad 4.5 cm diam., lilacina, acumina anguste acuta, stella alba vel griseo-alba. Columna antherarum subcylindrico-conica, asymmetra, antherae anguste lanceolatae 6.0-6.5 mm longae, basi cordatae; filamenta 1.5-2.5 mm longa, alba, glabra. Stylus 11 mm longus, 2.5 exsertus, basi ad 1/3 dense papillis praeditus, stigma capitatum, magnum, fissum; ovarium pyriforme; fructus rotundati. Ad seriem Tuberosa pertinet. Numerus cromosomatum $2n = 2x = 24$.

HABITAT: Adverso flumine Pacaymayo, 3900 m supra mare in regio maxime nubicola et frigida circa formosus reliquum architectonica inca inter virgultum et relictus nemus, Provinci Urubamba, Departamenti Cusco, PERU. C. Ochoa N°4001, Martius 1973. Holotypus: Herbarium Ochoanum.

SOLANUM LITUSINUM Ochoa sp. nov.

Herbaceum, tuberiferum. Plantae 60-70 cm altae, caules simplici vel ramificati, in parte basilari 8-10 mm crassi, duabus tertiis partibus

4 mm crassi, dilute virides, pilis brevibus sparsis obtecti, anguste alati alae rectae. Stolones usque ad 100 cm longi; tubera alba, rotunda usque ad ovalia, 2-3 cm longa. Folia imparipinnata, 7.8-14.5 x 5.2-8.7 cm, in utraque pagina pilis teneris induti, etiam rhachis et petioli, pilis simplices, 2-3 cellularibus et pilis brevibus glanduligeris intermixtae, glandulae tetralobulatae, ad axillas et basim petiolorum plus abundantes. Folia 3-juga et 0-2 interfoliola minuscula ornati, petioli 2.5-3.0 cm longi; foliola elliptico-lanceolata vel angustè elliptico-lanceolata, marginibus pilosis, irregulariter subdenticulatis. Foliolum terminale lateralibus solum paulo majus, 4.6-5.5 x 2.1-2.7 cm, apice acutum vel subacuminatum, basi rotundatum. Foliola lateralialia 2-7 mm, petiolulata; foliola primi et secundi jugis 3.9-4.5 x 1.6-2.0 cm; foliola primi jugis apice acuta et basi oblique rotundata, secundi jugis etiam acuta et basi rotundata. Foliola interjecta, num quando adsunt, parva 1.5-2.0 x 1.0-1.5 mm, elliptica et sessilia. Folia pseudostipulacea minuta, 2.5-3.0 x 1.5-1.8 mm, subfalcata. Inflorescentia cymosa 15-18-flora, pedunculi 5-7 cm longi, basim 2 mm crassi tamquam pedicelli pilosi et cum pilis glandulosis tetralobulatis intermixti. Calyx 9-8 mm longus, laete viridus, pilosus, lobi angustè elliptico lanceolati, in acumina acuta 1.5-2.0 mm longa producti. Corolla stellata, 3.0-3.5 cm. diam., violacea, stella interna flavo viride; columna antherarum cylindrico-conica, laeviter asymmetrica. Antherae lanceolatae, 7 mm longae, basi 1.6 mm latae, visibiliter cordatae; filamenta 0.5-1.0 mm longa, albo-hialina, glabra. Stylus 12 mm longus, 3.5-4.0 mm exsertus; basi 1/3 longitudinis papillis dense instructus; stigma parvum, ovale. Ovarium oval-pyriiformis. Fructus rotundati vel ovoides. Ad seriem Commersoniana pertinet; cromasomatum numerus $2n = 2x = 24$.

HABITAT: La Playa ca 2600 m supra mare in itinere Quebrada Seca-Arima interprovinces Valle Grande et Florida, prope Province Valle Grande circa finitimus Provinci Florida, Departamenti Santa Cruz, BOLIVIA. Col. C. Ochoa N°12027 Martius-1978. Holotypus: Herbarium Ochoanum, CIP.

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Solanum incasicum Ochoa. Holotypus

OCH-4001, ca. x 1/3.



Solanum litusinum Ochoa. Holotypus

OCH-12027, ca. x 1/3.

NEW SPECIES OF MYRISTICACEAE,
COMBRETACEAE, AND URTICACEAE FROM
COASTAL COLOMBIA AND ECUADOR

Alwyn H. Gentry¹
Missouri Botanical Garden

This paper describes three additional new species included in our recent collections from the coastal lowland forests of Colombia and Ecuador. Two of these species are canopy trees, one of them locally valued for timber. The new species are Iryanthera porcata A. Gentry, Terminalia valverdeae A. Gentry, and Pilea foreroi A. Gentry.

IRYANTHERA PORCATA A. Gentry, sp. nov.

Arbor ramulis glabratis. Folia subcoriacea, oblonga, ad basim cuneata, venatione brochidodroma. Inflorescentia racemiformis. Fructus depresso-globosus, 6 cm diametro, longitudinaliter porcatus.

Tree 20 m tall; branchlets inconspicuously sericeous with Malpighiaceae trichomes, soon glabrate. Leaves subcoriaceous, oblong, apices not seen, the base broadly cuneate to rounded, ca. 20-25 cm long, 4.5-6 cm wide, below flecked with scattered minute whitish 2-armed trichomes, ca. 20-23 (or more?) secondary veins on a side, the venation (except midvein) plane above, 3° venation plane below, 2° nerves below prominent and distinctly brochidodromous; petiole canaliculate, 1-1.5 cm long. Female inflorescence a cluster of several racemiform branches ca. 8 cm long, appressed reddish puberulous, conspicuously flattened and twisted between the alternate fascicles of flowers, the pedicels to 4 mm long. Female flowers minute, the triangular tepals ca. 1.5 mm long, rufous-puberulous. Fruit strongly depressed globose, ca. 6 cm in diameter, ca. 4.5 cm long, strongly longitudinally ridged and furrowed, also minutely corrugated, glabrous except inconspicuous scattered minute whitish T-shaped trichomes.

Type: COLOMBIA: Chocó: Road from Yuto to Lloró, alt. 50 m, pluvial forest along creek, ca. 2 km E of Yuto, 18 Jan 1979, Gentry and Renteria 24365 (holotype, COL; isotypes, INPA, MO, HUA, to be distributed)

1. Supported by NSF Grant INT-7920783.

In the absence of male flowers, sectional placement is problematic. Vegetatively this species seems close to Amazonian I. lancifolia Ducke, but that species has smooth rather than conspicuously ridged fruits. Iryanthera grandis Ducke, also Amazonian, has somewhat similar fruits which, despite being noted by A. C. Smith (1937) as the largest in the genus, differ in being smaller (4.5-5 cm diameter) and with a fenestrated rather than ridged surface. The only sympatric species similar to I. porcata is I. megistophylla A. C. Smith which has mostly much larger leaves and a smaller more transversely oblong fruit with a smooth to fenestrated-rugose surface.

TERMINALIA VALVERDEAE A. Gentry, sp. nov. -- Figure 1.

Arbor grandis. Folia obovata, petiolis 1-2 cm longis. Fructus transversim oblongi, bialati, 7-8 cm lati, corporibus carinatis, puberulis.

Large tree 30 m tall, bark longitudinally narrowly ridged; branchlets sparsely subappressed-pilose when young, glabrescent, irregularly longitudinally striate. Leaves obovate, acutish to obtuse at apex, cuneate to obtuse at base, chartaceous, 8-15 cm long, 3-7 cm wide, the 3^o venation plane above, prominulous below, glabrous above, below usually very sparsely scattered-puberulous near base of midvein and secondary veins; petiole slender, 1-2 cm long, glabrous or with a few scattered trichomes. Inflorescence (in fruit) puberulous. Flowers not seen. Fruits very large, transversely oblong, bialate, 2.2-3 cm long at center, 3.5-4.3 cm long across wings, 7-8 cm wide, the wings brown, subwoody, broader toward apices, the margins scalloped, the body flattened dorsally and sharply keeled ventrally, distinctly triangular in section, puberulous.

Type: ECUADOR: Guayas: Cerro Azul, entrado por Casas Viejas, Cordillera de Chongon, 200 m alt., Aug 1978, F. M. Valverde 301 (holotype, MO; isotypes, ECU, SEL).

Endemic to the wetter parts of the Cordillera de Chongon, north of Guayaquil in coastal Ecuador.

This species has one of the largest fruits of any New World Terminalia and is unique among neotropical species of the genus in having the wings broadest near their apices rather than gradually contracted apically and in having dis-

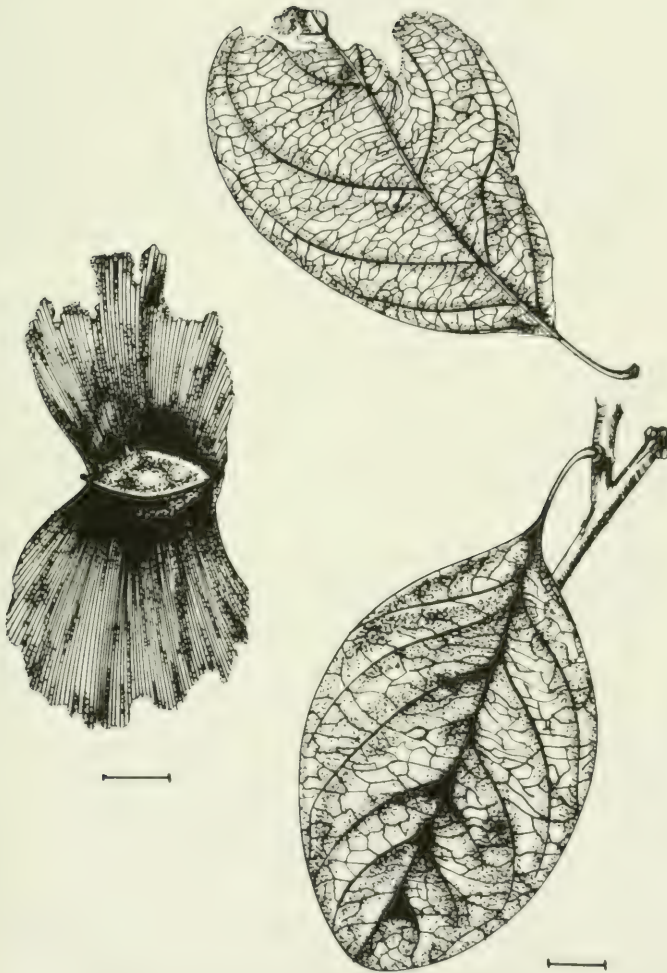


Figure 1. Terminalia valverdeae A. Gentry. From Valverde 301 (ECU). Lines represent 1 cm.

tinctly differentiated dorsal and ventral sides on account of the strongly keeled seed body. Its closest neotropical relative is probably T. januariensis DC. which approaches it in fruit size but has narrower wings and a less keeled body. Several Old World species of Terminalia such as African T. superba Engl. & Diels and T. orbicularis Engl. & Diels and southeast Asian T. subspathulata King have large fruits which may be distinctly keeled. Since some Old World species of Terminalia are sporadically cultivated in the neotropics, I at first suspected that the very distinctive Ecuadorian plant might represent an escape from cultivation. However, no Old World species represented at MO combines the sharp ventral keel and very large wings broader near the apex which characterize T. valverdeae. Moreover, I have observed T. valverdeae in the field and it is a mature forest canopy tree (though its habitat is rapidly disappearing) known to the campesinos as "castaña" and valued as a timber wood.

PILEA FOREROI A. Gentry, sp. nov.

Herba glabra, stipulis foliaceis. Folia late ovata, 20-25 cm longa, basibus subtruncatis atque minute vade cordulatis. Inflorescentia laxa paniculata, floribus minutis. Fructus ovatus, 1 mm longus.

Terrestrial herb, glabrous throughout; stipules foliaceous, oblong-elliptic, 3-3.5 cm long, 1.5-1.7 cm wide, rounded at apex. Leaves broadly ovate, acute to subacuminate at apex, 20-25 cm long, ca. 16 cm wide, broadly symmetrically subtruncate basally, extreme base shallowly subcordate with two short (ca. 2 mm long) broad basal lobes, 3-veined from ca. 1 cm above base, the margin serrulate to shallowly crenate-serrate, drying greenish gray, the main veins contrastingly paler below, the upper surface with linear cystoliths, the lower surface minutely punctate; petiole 15-16 cm long. Inflorescence axillary, openly paniculate, to 14 cm long, pink when fresh. Flowers whitish, minute, ca. 1 mm long, the 4 perianth segments apiculate. Fruits ovate, ca. 1 mm long.

Type: COLOMBIA: Chocó: Carretera Panamericana (en construcción). Río Pato, 5° 55' N, 76° 56' W, 21 Apr 1979, E. Forero, R. Jaramillo, H. Bernal, H. León, and M. Pulido 5477 (holotype, COL; isotype, MO).

In Killip's key (Contributions from the U. S. National Herbarium 26: 367-394. 1936) *P. foreroi* keys out with *P. rusbyi* (Britton) Killip, a completely different Bolivian species, on account of its large almost subentire leaves, long petioles, and open inflorescence. The new species has much larger leaves than any *Pilea* in the collections at MO, F, or US. The leaves are also distinctive in their long petioles and peculiar subcordulate bases. The only species which appears even remotely similar is *P. selbyanorum* Dodson and A. Gentry which has smaller but somewhat similar long-petioled leaves which, though usually peltate, occasionally have a cordate base. *Pilea selbyanorum* has a similar open inflorescence but much smaller stipules, a rounded leaf apex, and its leaf, when not peltate, is much more deeply cordate.

PASSIFLORA CAUDATA A. Gentry

In my description of *Passiflora caudata* (Phytologia 47: 97. 1980) the lines listing the type specimen were inadvertently omitted: ECUADOR. Pichincha: Cooperativa Santa Marta No. 2 along Río Verde 2 km SE of Santo Domingo de los Colorados, 530 m alt., 5 Feb 1979, Dodson, Gentry, and Duke 7585 (holotype, MO; isotypes, ECU, SEL, Río Palenque Science Center).

I thank C. Stace for commenting on *Terminalia valverdeae* and E. Forero, E. Renteria, C. Dodson, and F. M. Valverde for their collaboration in the field work which led to the discovery of these species.

CERTAMEN MELASTOMATACEIS XXXII.

John J. Wurdack

U. S. National Herbarium, Smithsonian Institution

PACHYLOMA NANUM Wurdack, sp. nov.

P. pusillo Wurdack affinis, foliorum laminis anguste ovatis 3(-5)-nervatis differt.

Suffrutex 10-18 cm altus; caulium nodi inconspicue decidue-que setulosi (0.3-0.5 mm) et internodi glabri. Petioli 0.1-0.2 cm longi; lamina 1.5-2(-2.5) X 0.7-0.9 cm anguste ovata apice acuta basi rotundato-obtusa, coriacea et integra vel apicem versus sparse subtiliterque serrulata marginibus incrassatis, glabra, 3(-5)-nervata. Flores terminales solitarii vel terni; pedicelli 3-4 mm longi ad medium bibracteolati, bracteolis ca 1.8 X 0.4-0.5 mm lanceatis. Hypanthium (ad torum) 6 mm longum glabrum; calycis tubus ca 0.1 mm longus, lobis interioribus 0.2-0.4 mm longis obscuris sparse glanduloso-ciliolatis (0.1 mm) dentibus exterioribus inconspicuis non eminentibus. Petala 8.5-10 X 7.5-8 mm elliptica apice late acuta et setula unica 0.2-0.25 mm longa terminata alioqui glabra. Stamina vix dimorphica; filamenta 6.5-7 mm longa glabra; antherarum thecae 5.8-6 X 0.5 mm subulatae, poro 0.2 mm diam. ventraliter inclinato; connectivum 1-1.7 mm prolongatum ad basim dorsaliter cauda 2 mm longa armatum, appendice ventrali acute 1.2 mm bilobulata et ad basim 0.2 mm callosa. Stigma punctiforme; stylus 12 X 0.25 mm glaber; ovarii apex glaber.

Type Collection: G. Davidse, O. Huber, & S. S. Tillett 17422 (holotype MO 2769063; isotypes US, VEN), collected in white sand savanna at Cucurital de Yagua, Caño Yagua, 66° 34' W, 3° 36' N, Depto. Atabapo, Terr. Amazonas, Venezuela, elev. ca 120 m, 8 May 1979. "Corolla reddish purple; filaments white below, reddish purple above; anthers reddish brown."

Paratype: O. Huber 2565 (US, VEN), topotypical, fruiting.

Pachyloma pusillum has oblong 1-nerved leaf blades mostly (at least on mature shoots) 0.7 cm or less wide and proportionately much narrower; three recent collections from Canaripó (lower Río Ventuari east of the junction with Río Orinoco) are Steyermark & Redmond 112841 and Huber 1071 and 1899. *Pachyloma nanum* also resembles a miniature version of *P. huberioides* (Naud.) Triana (which lacks incrassate leaf margins) or *P. coriaceum* DC. (with thicker oval leaf blades). Several other undescribed (fruiting only) taxa of *Pachyloma* have been collected in northern Brazil and southern Venezuela.

MERIANIA AMISCHOPHYLLA Wurdack, sp. nov.

M. weberbaueri Macbride affinis, foliis essentialiter sessilibus subtus sparse stellulato-puberulis differt.

Ramuli obtuse sulcato-tetragoni sicut foliorum venae

primariae subtus inflorescentiae axes principalesque modice vel sparse setosi pilorum apice laevi 0.7-1.5(-2) mm longo basi expansa aspera et modice pilis stellulato-pinoideis 0.1-0.3 mm longis induti. Folia essentialiter sessilia (petiolo crasso 0.1-0.3 cm longo); lamina (9-)13-18 X (3-)5-7 cm elliptica apice gradatim acuminato basi rotundata, subrigida et obscure distanterque calloso-serrulata, supra glabra, subtus in superficie sparse pilis stellulato-pinoideis ca 0.1 mm longis et 0.2 mm latis puberula, breviter (0.5-2 cm) 5-plinervata nervis secundariis ca 3-4 mm inter se distantibus nervulis subtus planis obscuris areolis ca 0.4 mm latis. Inflorescentia 8-15 cm longa submultiflora; flores 5-meri ad ramorum apices subumbellate dispositi; pedicelli 0.7-1 cm longi sicut hypanthia dense incurvo-setosi pilorum apicibus protractis laevibus tenuibus ca 1-2 mm longis basibus expansis 0.2-0.3 mm diam. dense asperis. Hypanthium (ad torum) 6 mm longum obscure costulatum; calycis tubus 3.5-4 mm longus, lobis interioribus 6.5 mm longis ovato-oblongis rotundatis ciliolatis demum deciduis, dentibus exterioribus crassis ca 1-1.5 mm eminentibus; torus intus sparsiuscule setulosus. Petala 19-24(-32) X (15-)17-21(-23) mm asymmetricice obovata apice rotundato et paulo emarginato apicem versus obscure caduceque glanduloso-ciliolata (0.1 mm) alioqui glabra. Stamina dimorpha glabra; filamenta 12.5 mm vel 12 mm longa; antherarum thecae subulatae 9.5 X 1.3 mm vel 10 X 2 mm, poro 0.3-0.4 mm diam. dorsaliter inclinato; connectivum non prolongatum dorsaliter ad filamentum insertionem paullulo (0.4 mm vel 0.2 mm) elevatum, appendice dorsali 2.8-3 X 3 mm rotundata 0.2 mm apiculata vel 4 X 1 mm obtusa. Stigma 0.7 mm diam.; stylus 14 X 1-0.5 mm glaber in ovarii cono ca 0.4 mm immersus; ovarium 5-loculare glabrum apice obtuse 5-lobulato.

Type Collection: Jose Schunke 9842 (holotype US 2902542; isotype MO), collected in high forest in the cumbre of Divisora, Dto. Padre Abad, Prov. Coronel Portillo, Depto. Loreto, Peru, elev. 1500-1600 m, 6 Feb. 1978. "Arbusto de 3-4 m. Flores strong reddish purple; anteras amarillas; sepalos rugosos, de color pardo amarillente. Hojas rugosas."

Paratype: J. Schunke 11374 (MISSA, US), topotypical.

Meriania weberbaueri has leaves with petioles 3-7 cm long and blades beneath more densely pubescent, the surface hairs mostly with protracted smooth tips (and stellulate bases); in stamen morphology, the two species are alike. No other species in Sect. Umbellatae has sessile leaves and most of them have anther connectives prolonged below the thecae to the filament insertion.

MICONIA LIESNERI Wurdack, sp. nov.

M. metallica (Naud.) Triana affinis, foliis subsessilibus ad basim cordatis floribus 4-meris differt.

Ramuli teretes sicut folia glabri. Folia in quoque pari paullulo inaequalia; petioli 0.3-0.5 cm longi crassi; lamina 17-28 X 9-15 cm elliptica apice subabrupte 1-1.5 cm hebeti-acuminato basi 0.7-1 cm cordata, tenuiter coriacea et integra, 5-nervata

vel breviter pseudo-plinervata nervis secundariis 5-8 mm inter se distantibus nervulis subtus creberrime elevato-reticulatis areolis ca 0.2 mm latis. Panicula 4-11 cm longa submultiflora, ramis primariis in quoque nodo 2 vel 4, glandulis minutis (0.05 mm) sparsis exceptis glabra; flores semper 4-meri sessiles, bracteo-
lis ca 1 X 0.3-0.4 mm oblongis subpersistentibus. Hypanthium (ad torum) ca 2.7 mm longum glabrum; calyx 0.8 mm altus truncatus, dentibus exterioribus 0.2-0.3 mm longis apiculatis patentibus; torus intus densiuscule glandulis 0.1 mm longis obsitus. Petala glabra 6.2-6.3 X 1.9-2 mm oblonga apice rotundato vel paulo emarginato. Stamina isomorphica glabra; filamenta 3-3.1 mm longa; thecae 2.6-2.7 X 0.45 X 0.45 mm oblongo-subulatae poro 0.1-0.15 mm diam. dorsaliter inclinato; connectivum non prolongatum ad basim dorsaliter dente hebeti 0.4 mm longo armatum ventraliter exappendiculatum. Stigma ca 0.3 mm diam.; stylus 6 X 0.3-0.2 mm glaber; ovarium 4-loculare et ca 3/4 inferum, cono 0.3 mm alto modice glanduloso.

Type Collection: J. A. Steyermark, R. Liesner, & A. González 119642 (holotype US 2910804; isotypes MO, VEN), collected on sandstone slopes of Cerro de Cuite, along Quebrada La Colorada 4 km south of Campamento La Colorada south of Santo Domingo, 7° 30' N, 72° 5' W, Estado Táchira, Venezuela, elev. 450 m, 8 November 1979. "Shrub 1 m tall; leaves subchartaceous, deep green and transversely veined above, silvery green below; apex of petiole dull lavender. Inflorescence pendent; petals pale buff-white; calyx pale green; rachis and pedicels coral red."

Paratype: J. Cuatrecasas 13092 (US), from "hoya del río Cubugón, El Indio, región del Sarare, Cordillera Oriental," Depto. Norte de Santander, Colombia, elev. 420-480 m, 13 Nov. 1941. "Frutex. Hojas coriáceas. Pétalos blancos."

The suggested relative has leaf blades narrowed (sometimes obscurely auriculate) to the base and with laxer (0.5-1 mm) venule areoles, 5-merous flowers, anther connectives dorsally not appendaged, and 3-celled ovaries, but similar calyx, petals, and toral glands. Miconia liesneri does not seem to be closely related to M. asclepiadea Triana nor M. cruenta Triana; M. anisophylla Triana (of which I have seen only the type collection) has similar leaf venulation, but smaller 5-merous flowers with exappendiculate stamens and leaves quite unequal in each pair. The inflorescences in M. liesneri are terminal but soon overtopped by lateral branchlet growth.

MICONIA HEXAPETALA Wurdack, sp. nov.

M. roseae Gleason affinis, floribus 6-meris stigmatibus expanso ovario omnino infero differt.

Ramuli teretes sicut petioli laminarum venae primariae subtus inflorescentiae axis ramique modice vel sparse pilis crassis asperis 0.4-0.7(-1) mm longis et dense pilis stellulato-pinoideis 0.1-0.2 mm longis setulosi. Petioli (1)-2-3(-3.5) cm longi; lamina (10-)14-22 X (4-)6-12 cm elliptica apice paullo subabrupteque per 1-1.5 cm hebeti-acuminato basi obtusa, subrigida et obscure undulato-serrulata, supra glabra, subtus in venis

secundariis sparse stellulato-pinoideo-puberula in venulis superficieque glabra, 5-nervata (nervi debili inframarginali incluso) nervis secundariis 3-4 mm inter se distantibus nervulis subtus planis areolis ca 0.5-0.8 mm latis. Panicula 8-10 cm longa pauciflora; flores plerumque 5-meri, pedicellis 6-13 mm longis et ca 0.5-1 mm infra hypanthium articulatis, bracteolis (delapsis ?) non visis. Hypanthium (ad torum) 3-4 mm longum extus dense pilis crassis 0.2-0.3 X 0.2 mm asperis indutum intus supra ovarium sparse glandulosum; calyx 6-7 mm altus intus dense sericeo-strigosus in alabastro clausus demum in lobos 4-5 usque ad 2 mm supra torum irregulariter dehiscens; torus intus sparse vel modice glanduloso-puberulus. Petala 13-15 X 5-7 mm obovato-oblonga pruinosa. Stamina in dimensionibus paulo dimorphica; filamenta 2-2.5 mm vel 7.5-8.5 mm longa modice glanduloso-puberula (0.1 mm); antherarum thecae 6-6.4 vel 5-5.6 X 0.9 X 0.7 mm oblongo-subulatae, poro 0.1-0.15 mm diam.; connectivum non prolongatum exappendiculatum dorsaliter ad basin sparse glandulis minutis ornatum. Stigma expansum 2.3-2.6 mm diam.; stylus 11-12.5 X 1-1.7 mm modice glanduloso-puberulus in ovarii apicem paulo immersus; ovarium 6-loculare et omnino inferum (cono non evoluto) apice glabro.

Type Collection: José Schunke 11432 (holotype US 2894032; isotype MISSA; isotypes to be distributed, AMAZ, DUKE, F, FSU, IBE, K, MO, NY, RB, RSA, TEX, VDB, USM), collected in high forest on trail to caserío San Agustín, La Divisoria, Dto. Hermilio Valdizán, Leoncio Prado, Depto. Huánuco, Peru, elev. 1600-1500 m, 28 April 1980. "Shrub 2-3 m; flowers purplish white; anthers deep purplish pink; sepals greenish yellow. Fruit 13 mm long, 14 mm diam."

Paratype: E. E. Smith & Jorge Vera 375 (US), from "between Divisoria and Carmen Alto, Tingo Maria," (Huánuco ?) Peru, elev. ca 1450 m, 18 March 1954. "White recurved petals and pink stamens."

The suggested Bolivian relative (isotype US) has 5-merous flowers, barely expanded stigma ca 1 mm diam., and a developed ovary cone. Another possible relative is M. muricata (Don) Triana (isotype US), which is similar in vegetative pubescence and foliar venulation, but with 5-merous fruit and a developed ovary cone. Miconia rosea may well be synonymous with M. muricata, but all Peruvian collections (the most recent being Schunke 2131, Río Chino, Padre Abad, Coronel Portillo, Loreto, 1000-1100 m) are fruiting only. My earlier (Phytologia 23: 474. 1972) acceptance of Macbride's tentative synonymization of M. glandulifera Cogn. under M. muricata seems wrong; the latter species has laxer foliar venulation and flowers which seem too small (and without long hypanthial hairs) to develop into the large fruit found in M. muricata. Of the 15 examinable flowers and buds in M. hexapetala, 3 showed 5 petals and the remainder 6 petals.

MICONIA GENTRYI Wurdack, sp. nov.

M. ingenti Wurdack affinis, foliorum laminis subtus

petiolis hypanthiisque setosis ovarii apice setuloso et dense resinoso-granuloso differt.

Ramuli primum obscure quadrangulati mox teretes sicut petioli inflorescentia hypanthiaque dense setosi pilis ca 1.5-2.5 mm longis basim versus paulo asperis et modice pilis amorpho-pinoideis ca 0.1-0.3 mm longis puberuli. Petioli 2-4 cm longi; lamina (12-)15-20 X (7-)9-15 cm late elliptica apice abrupte vel subabrupte per 0.5-1 cm acuminato basi obtusa vel rotundato-truncata, chartacea et obscure distanterque undulato-serrulata, supra sparsiuscule setosa pilis 2-3 mm longis gracilibus laevibus, subtus in venis primariis secundariisque modice pilis subamorpho-pinoideis 0.1-0.2 mm longis puberula et sicut venis tertiariis sparse resinoso-granulosa et modice setosa pilis ca 1-1.5 mm longis gracilibus laevibus, 5(-7)-nervata nervis secundariis ca 5 mm inter se distantibus nervulis subtus planis modice reticulatis (areolis ca 0.5 mm latis). Panicula 4-5 cm longa multiflora; flores 5-meri congesti, pedicellis crassis ca 1-2 mm longis, bracteolis 3-4 X 1.5-2 mm oblongis deciduis plerumque ad hypanthii basim insertis. Hypanthium (ad torum) 4 mm longum intus dense resinoso-granulosum; calyx 2.5-3 mm longus truncatus intus glaber. Petala 13-13.5 X 15-16 mm late obovata paulo cucullata intus glabra extus dense indumento appresso subamorpho-pinoideo induta. Stamina essentialiter isomorphica; filamenta 10 mm longa modice glanduloso-puberula (0.1-0.15 mm); thecae 6.5-7 X 1 X 1.5 mm subulatae poro 0.2-0.3 mm diam. ventraliter inclinato, connectivo non prolongato dorsaliter ad basim ca 0.2-0.3 mm eminenti juxta thecas basaliter glandulis sessilibus dense obsito. Stigma capitellatum 1.6-1.7 mm diam.; stylus paulo immaturus ca 6.5 X 1-0.8 mm basim versus strigosus; ovarium 3-loculare et ca 3/4 inferum, cono ca 0.7 mm alto paulo setuloso (0.1-0.2 mm) et dense resinoso-granuloso.

Type Collection: A. Gentry, E. Forero, M. Dillon, E. Renteria, L. Skog, M. Sousa, & D. Lellinger 28624 (holotype US 2863846; isotypes COL, MO), collected in cloud forest on Alto de Nique (southernmost peak of Cerro Pirre massif) exactly on Panama/Colombia border, elev. 1300-1500 m, 19 April 1980. "Tree 15 m; Flowers pink."

The suggested relative has similar upper leaf surface hairs, stamens and stigma, but only an amorpho-granulose indument on the branchlets, petioles, veins and venules on the leaf blades beneath, and hypanthia, as well as glabrous ovary apices.

MICONIA MOOREI Wurdack, sp. nov.

M. anisotrichae (Schlecht.) Triana affinis, foliis minoribus 5-plinervatis inflorescentiis divaricatis floribus minoribus differt.

Ramuli primum obscure tetragoni mox teretes sicut petioli laminarum subtus venae primariae inflorescentia hypanthiaque primum modice pinoideo-puberuli pilis 0.1-0.2(-0.3) mm longis et sparse vel sparsiuscule setulosi pilis laevibus 0.3-0.5(-1) mm longis. Petioli 0.5-1(-2) cm longi; lamina (3-)4-7 X 1.5-2.3 cm lanceata vel oblongo-lanceata apice anguste acuto basi obtusa vel

rotundato-truncata, chartacea et minute ciliolato-serrulata, supra subaspera et sparse strigulosa pilis laevibus ca 0.3(-0.5) mm longis, subtus in venis secundariis tertiariisque sparse vel sparsissime setulosa in superficie glabra, breviter (0.3-0.5 cm) 5-plinervata nervis secundariis 2-3 mm inter se distantibus. Inflorescentia submultiflora primum terminalis mox pseudo-lateralis 2-3 cm longa diffusa e basi ramosa; flores 5-meri, pedicellis 1(-2) mm longis, bracteolis ca 0.5-1 mm longis linearibus. Hypanthium (ad torum) 1.7 mm longum; calycis tubus 0.3 mm longus, lobis interioribus 0.5 mm longis ovato-rotundatis in sinubus extus setulis glanduliferis 1-2 armatis, dentibus exterioribus lobos interiores aequantibus setula terminatis. Petala ut videtur rubro-tincta glabra 2.6-2.8 X 1.4-1.8 mm oblongo-elliptica apice rotundato-acuto. Stamina glabra in dimensionibus paululo dimorphica; filamenta 1.7-2 mm longa; antherarum thecae 0.9-1.2 X 0.45 X 0.45 mm oblongae poro terminali 0.1 mm diam.; connectivum ad basim 0.2-0.25 mm prolongatum non expansum. Stigma non expansum; stylus 5.8 X 0.25-0.15 mm basim versus sparse glanduloso-puberulus (0.1 mm); ovarium 3-loculare 1/2 inferum apice sparse glanduloso-setuloso (0.15 mm).

Type Collection: H. E. Moore Jr. 2003 (holotype BH; isotype US), collected near Molango on road to Lolotla, Hidalgo, Mexico, elev. ca 1100 m, 9 Nov. 1946. "Flowers pinkish."

Paratype: C. A. Purpus 6105 (US), from Sierra Madre between Misantla and Naolinco, Vera Cruz, Mexico, August 1912.

Miconia anisotricha has ovate (length/width ratio 1.5-2, rather than 2.5-3.3) 5-7-nerved leaf blades, erect inflorescences very tardily overtopped by vegetative growth, hypanthia 3-4 mm long, broader petals and longer anthers; the same differences apply to M. erythrantha Naud. All three taxa are qualitatively alike in trichome forms, subacute petals, oblong anthers with slight basal connective prolongation, sparsely glandular-puberulous style and ovary apex, unexpanded stigma, and 3-celled 1/2 inferior ovaries. As previously discussed (Phytologia 14: 270. 1967), the correct generic disposition for this species-group is undetermined. The paratype of M. moorei was distributed as Clidemia aff. petiolaris (S. & C.) Schlecht. ex Triana, as well as an unpublished Standley name. Hal Moore, a good friend in the past, should have long since been commemorated in the melastomes.

MICONIA AMNICOLA Wurdack, sp. nov.

Sect. Miconia. M. elaeagnoidi Cogn. affinis, foliis basaliter nervatis bracteolis floribusque maioribus differt.

Ramuli primum quadrangulati mox teretes sicut petioli foliorum laminae subtus inflorescentia hypanthiaque pilis appressis stellulato-lepidotis omnino obtecti. Petioli (0.5-)1-1.5(-2.5) cm longi; lamina 7-14(-20) X 2.5-4(-6) cm anguste oblongo-elliptica apice gradatim acuminato basi acuta, firme chartacea et integra, supra glabra, 3-nervata (pari debili ca 0.5-1 mm inframarginali neglecto) nervis secundariis ca 4 mm inter se distantibus nervulis subtus planis laxe (ca 1-2 mm) reticulatis.

Panicula 7-11 cm longa oblonga multiflora, ramis primariis 1-2 cm longis, ramulis ultimis ad anthesim ca 1 cm longis secundifloris; flores 5-meri sessiles, bracteolis 3-4 X 0.5-0.7 mm demum deciduis. Hypanthium (ad torum) ca 2.8 mm longum; calycis tubus 0.5 mm longus, lobis 0.3-0.5 mm altis deltoideis in fructu persistentibus, dentibus exterioribus obscuris. Petala glabra 3 X 1.5-1.6 mm oblongo-obovata paullulo emarginata. Stamina dimorphica glabra; filamenta 4.7-4.8 mm vel 4 mm longa; thecae oblongae, poro ca 0.25 mm diam. ventraliter inclinato. Stamina maiora: thecae 2.5-2.6 X 0.4 X 0.45 mm; connectivum 0.5-0.6 mm prolongatum, appendice basali 0.6-0.7 X 0.8 mm cordiformi. Stamina minora: thecae 2-2.3 X 0.4 X 0.4 mm; connectivum 0.3-0.4 mm prolongatum ad basim 0.15-0.2 mm trilobulatum. Stigma expansum 0.6-0.7 mm diam.; stylus 7.5 X 0.2-0.4 mm glaber; ovarium 3-loculare et 2/3 inferum, cono 0.4 mm alto glabro.

Type Collection: José M. Schunke 158 (holotype US 1459065), collected at Gamitanacocha, Río Mazan, Depto. Loreto, Peru, elev. 100-125 m, February 1, 1935. "Bush 3 m. Flowers white."

Paratypes (all Depto. Loreto, Peru; US): Río Marañón near mouth of Río Tigre, elev. 115 m, Killip & Smith 27530 ("Tree 15-20 feet"); Iquitos, elev. 100 m, Killip & Smith 27032 ("Tree 10-15 feet"), Llewelyn Williams 3660; mouth of Río Momon at Río Nanay, Sidney McDaniel 13631 ("Shrub; mature fruit purplish"); Río Momon, Revilla 2501 ("Arbol ribereño 8 m; frutos rojos marrones"); Río Tacsha Curaray, Croat 20418 ("Tree 5 m; fruits green to orange"); Río Nanay above Bellavista, Rimachi 3461 ("3 m; fruit blue"); Pampa Chica to Mapa Cocha, Río Nanay, McDaniel & Rimachi 22262 ("6 m; corolla and filaments white; immature fruits orange").

The suggested relative has distinctly (albeit shortly) plinnerved leaves, bracteoles ca 1 mm long, hypanthium plus calyx ca 1.7-1.9 mm long, distant minute (0.1 mm) calyx lobes, petals 2.3-2.5 X 1.2-1.3 mm, and anther thecae 1.4-1.5 mm or 1.2-1.3 mm long. Miconia punctata (Desr.) Don ex DC. has more sharply 4-angled branchlets, (usually) relatively broader leaves, bracteoles only 0.5-1 mm long, shorter hypanthia and anthers, and stellulate-puberulous ovary apices. Schunke 158 was distributed as (and cited in the Flora of Peru) M. serialis DC. (with formless pubescence on the lower leaf surfaces) and the Killip & Smith and Williams material had been identified as M. chrysophylla (Rich.) Urban (with 3-4-whorled leaves, smaller flowers, and rimose anthers).

MICONIA ZARUCCHII Wurdack, sp. nov.

M. wittii Ule affinis, bracteolis maioribus persistentibus antherarum connectivis non prolongatis differt.

Ramuli primum sulcato-tetragoni mox teretes sicut folia subtus inflorescentia hypanthiaque pilis stellulato-lepidotis 0.1-0.15 mm latis omnino obtecti. Petioli 0.8-1.5 cm longi; lamina (7-)10-15(-19) X (1-)2-3(-3.5) cm anguste oblongo-elliptica apice gradatim acuminato basi late acuta, tenuiter coriacea et integra, supra glabra, trinervata nervis secundariis 3-5 mm inter se

distantibus nervulis subtus obscuris ob indumentum occultis. Panicula 6-9 cm longa submultiflora; flores 5-meri sessiles ad ramorum apices congesti; bracteolae ca 3 X 2 mm persistentes. Hypanthium (ad torum) 2.5 mm longum paulo costulatus; calycis tubus 0.8 mm longus, lobis interioribus 0.1-0.2 mm longis remotis, dentibus exterioribus obscuris. Petala 2.8 X 1.5-1.7 mm obovata paulo emarginata glabra. Stamina paulo dimorpha glabra; filamenta 4 mm longa; antherarum thecae 2.7-3 X 0.2-0.25 mm anguste oblongae, poro 0.1 mm diam. ventraliter inclinato; connectivum non prolongatum ad basim appendice corniformi 0.4 X 0.45 mm vel dentibus ventralibus 0.2 mm longis armatum. Stigma 0.4-0.45 mm diam. clavate expansum; stylus 5 X 0.2 mm glaber in ovarii apicem 0.2 mm immersus; ovarium 3-loculare et 1/2 inferum, cono ca 0.7 mm alto apice sparse lepidoto-puberulo.

Type Collection: J. L. Zarucchi 1632 (holotype US 2816631), collected along stream across from Mitú, Vaupés, Colombia, 22 May 1976. "Treelet 4 m tall; flowers white; fruit grey."

Paratypes (both Colombia): Schultes & Cabrera 12555 (US), from Soratama, Río Apaporis between Río Pacoa and Río Kananari, Amazonas-Vaupés, elev. ca 250 m; Zarucchi 2439 (US), topotypical ("Shrub 2 m tall; fruit pale red-orange").

Miconia wittii has caducous linear floral bracteoles only 0.2-0.4 mm wide, somewhat longer calyx lobes (0.4-0.6 mm), anther connectives prolonged 0.6-0.9 mm, and ovary moderately lepidote-puberulent at the apex. Vegetatively, M. zarucchii resembles the narrow-leaved element of M. wittii (Mem. N. Y. Bot. Gard. 10, 5: 172. 1964) and Schultes & Cabrera 12555 (fruiting) was cited as that species. A vegetative semblance also exists with M. amnicola (vide supra).

MICONIA SUBULIPETALA Wurdack, sp. nov.

M. acutipetalae Sprague affinis, foliorum laminis 3-nervatis eciliatis esetulosis venularum areolis amplioribus differt.

Ramuli teretes primum sicut petioli sparse vel modice setulosi pilis laevibus 0.5-1(-2) mm longis et modice stellulato-pinoideo-furfuracei demum glabrati. Petioli (0.3-)0.5(-0.8) cm longi; lamina (3-)4-9 X (2-)2.5-3.5 cm elliptica vel oblongo-elliptica apice per 1-1.5(-2) cm subgradatim hebeti-acuminato basi rotundato-obtusa, chartacea et integra eciliata, supra glabra, subtus secus venas primarias sparse decidueque pilis stellulato-pinoideis 0.1-0.2 mm longis armata alioqui glabra, 3-nervata nervis secundariis ca 3 mm inter se distantibus nervulis subtus planis laxe reticulatis (areolis 1.5-2 mm latis). Inflorescentia 2-5 cm longa pauciflora ramis 2-4 in quoque nodo sparsiuscule stellulato-pinoideo-puberulis et sparse vel sparsissime setulosis; flores 5-meri, pedicellis 1-1.5(-4) mm longis, bracteolis 0.2-0.3 mm longis linearibus caducis. Hypanthium (ad torum) 1.2-1.4 mm longum basaliter sparse decidueque stellulato-furfuraceum apicem versus glabrum; calyx 0.4 mm altus truncatus, dentibus exterioribus setuliformibus ca 0.25 mm eminentibus. Petala vix granulosa 3.8-3.9 X 0.8 mm oblonga apice acuto et 0.1-0.15 mm apiculato. Stamina dimorpha glabra; filamenta 2.5 mm

vel 2 mm longa. Stamina maiora: thecae 1.2 X 0.15 X 0.15 mm oblongae poro 0.1 mm diam. ventraliter inclinatio; connectivum 1 mm prolongatum dorsaliter ad basim dente triangulari 0.6-0.7 X 0.4 mm armatum ventraliter exappendiculatum. Stamina minora: thecae 1 X 0.2 mm oblongae poro 0.1 mm diam. dorsaliter inclinatio; connectivum 0.8 mm prolongatum ad basim 3-lobulatum lobulis ventralibus duobus 0.15 mm longis lobulo dorsali 0.15-0.2 mm longo. Stigma non vel vix expansum 0.2 mm diam.; stylus 4.8 X 0.15 mm glaber; ovarium 2-loculare et $2/3$ inferum, cono 0.4 mm alto glabro.

Type Collection: Manuel Rimachi 3421 (holotype US 2910986; isotype MISSA), collected in upland forest on trail from caserio de Grau 2nd zone, Río Momón, Dto. Iquitos, Prov. Maynas, Depto. Loreto, Peru, 7 March 1978. "8 m. Corolla white."

Miconia acutipetala, still known to me only from the original collection, has 5-nerved or 5-pseudoplinerved ciliolate leaf blades sparsely setulose on both surfaces and with venule areoles beneath only 0.7-1 mm wide. No qualitative floral differences between the two species are evident. Both taxa are related to M. tetrasperma Gleason. Of the four ovaries dissected in M. subulipetala, two had only one ovule in each locule and two had one ovule and two ovules in the two locules.

ALLONEURON ECUADORENSE Wurdack, sp. nov.

A. hexameri Wurdack et A. sneidernii Wurdack affinis, foliis subtus setulosis differt.

Ramuli sulcato-tetragoni sicut petioli inflorescentiaque dense setulosi pilis 0.7-1.5 mm longis ad basim expansis et obscure papillatis. Petioli 5-5.5 cm longi; lamina 18-20 X 12-13.5 cm ovato-elliptica apice per 1.5-2 cm late acuminato basi obtusa, subrigida et obscure serrulata, supra paulo rugulosa et sparsiuscule setulosa pilis usque ad 1 mm longis ad basim robustis, subtus dense setulosa pilis gracilibus ca 1 mm longis, 7-nervata vel obscure (0.5 cm) plinervata nervis secundariis 3-5 mm inter se distantibus. Panicula ca 18 cm longa multiflora; flores haplostemonae 7-9-meri, pedicellis 3-5 mm longis sicut hypanthiis pilis usque ad 1.5 mm longis incurvis modice setosis. Hypanthium (ad torum) 5 mm longum; calyx in alabastris ca 8 mm altus clausus demum irregulariter in lobis plus minusve deciduis fissus post anthesim ca 1.5 mm supra torum dehiscens. Petala glabra 8.5-10 X 4.5 mm obovato-rhomboidae acuta unguiculata. Stamina isomorphica glabra; filamenta 3.8 mm longa; antherarum thecae 1.6 X 0.5 X 0.3 mm poro singulo 0.2 mm diam. dorsaliter inclinatio, appendice dorsali 0.3 mm longa hebeti-acuta. Stigma non expansum; stylus 9 X 0.4-0.2 mm glaber; ovarium (3-)4-loculare omnino inferum apice glabro alis 7-9 cum hypanthio conjuncto.

Type Collection: A. Gentry & G. Shupp 26552 (holotype US 2856667; isotype MO), collected in Río Blanco drainage above Chical ca 12 km west of Maldonado, Prov. Carchi, Ecuador, elev. 1300-1500 m, 25 Sept. 1979. "Tree 15 m. Flowers lavender."

Both Colombian relatives have pubescence on the leaves beneath sparse and confined to the principal veins. In flowers,

A. sneidernii has closer affinities, but with the dorsal stamen spur much longer (1-1.7 mm). Alloneuron was previously known only from Colombia and Peru; it is distinguishable from other Ecuadorian genera by the haplostemony and capsular fruit developing from a completely inferior ovary.

TOCOGA RACEMIFERA Wurdack, sp. nov.

T. caquetanae Sprague affinis, inflorescentia racemiformi differt.

Ramuli sicut laminarum venae primariae subtus petioli formicariaeque densiuscule setosi pilis 2-4 mm longis eglandulosis pilis glanduliferis ca 1-1.5 mm longis sparse intermixtis et modice vel sparse stellato-puberuli (pilis 0.2-0.25 mm latis sessilibus). Folia tenuia ciliata ubique sparse setosa (pilis 1-2.5 mm longis) venularum areolis subtus laxis in quoque pari plerumque disparilia (uno sine formicario), rare aequalia et ambo cum formicariis. Folia maiora: petioli liberi ca 1 cm longi; formicaria ca 1.5 cm longa ad petiolorum apices evoluta et in laminarum bases paullulo immersa; lamina 17-28(-40) X 7.5-14(-16) cm elliptica apice subabrupte per 1.5-2 cm acuminato basi late acuta vel obtusa, distanter crenulato-serrulata, breviter 5-pseudoplinervata nervis secundariis ca 5-7 mm inter se distantibus. Folia minora: petioli 0.3-0.5 cm longi; lamina 4-7 X 2-5 cm late ovato-elliptica apice breviter (0.3-0.5 cm) acuminato basi cordulata obscure undulato-serrulata 3(-5)-nervata nervis secundariis ca 2-3 mm inter se distantibus. Inflorescentia primum terminalis demum lateralis racemiformis 9-24 cm longa densiuscule setosa pilis ca 2 mm longis plerumque eglanduliferis et sicut hypanthia dense stellato-puberula. Flores 5-meri, pedicellis ad anthesim ca 0.5 mm longis, bracteolis ca 1 mm longis lanceatis setuliferis persistentibus. Hypanthium (ad torum) 2.6-2.7 mm longum densiuscule glanduloso-setulosum (pilis 0.8-1 mm longis) in fructu sicco obtuse 10-costatum; calycis tubus 0.1 mm longus, lobis interioribus ca 0.3-0.5 mm longis ciliolatis, dentibus exterioribus setulosus ca 0.7-1 mm eminentibus. Petala glabra 3-3.1 X 0.8-0.9 mm obovato-oblonga apice rotundato vel paulo retuso. Filamenta 3-3.1 mm longa glabra; antherarum thecae 2.8-3 X 0.3-0.35 mm oblongo-subulatae, poro 0.1 mm diam. dorsaliter inclinato; connectivum non prolongatum dorsaliter supra basin vix elevatum. Stigma paulo expansum 0.5 mm diam.; stylus 8 X 0.2-0.3 mm glaber in ovarii apicem paullulo (0.1-0.2 mm) immersus; ovarium 4-loculare et 2/3 inferum, apice 0.5 mm alto glabro.

Type Collection: W. S. Alverson, Starker White, & John D. Shepherd 66 (holotype US 2850614; isotype WIS), collected in wet forest 3 km from Planta Providencia 28 km southwest of Zaragoza, Río Anorí valley, Depto. Antioquia, Colombia, elev. 400-700 m, 21 Feb. 1977. "Shrub 3 m. Inflorescence hairs red."

Paratypes (all Colombia): Alverson, White, & Shepherd 282A (US, WIS), topotypical ("Shrub 2 m. Inflorescence hairs pink. Ants are Pheidole sp."); J. Denslow 2145 (WIS) and 2314 (US, WIS), both topotypical; Linda Albert de Escobar & Gloria Carmona

s. n. (US), from Puerto Valdivia, Antioquia, elev. 500 m ("Arbusto de 2.5-3 m estatura. Formicaria habitada de hormigas amarillas, Pheidole"); N. C. Fassett 25410 (US), from Cerro la Isla, Landazuri region 70 km north of Velez, Depto. Santander, elev. ca 900 m, 29 June 1944 ("Young fruit orange").

Tococa caquetana has non-emergent external calyx teeth, broader petals, a more pronounced dorsal hump on the stamen connectives, and (along with its relatives T. parviflora Triana and T. tetramera Wurdack) branched inflorescences. No mature buds of T. racemifera were available so the calyx dehiscence is unknown; however there is no close affinity with the other racemiflorous species. For several years, I had filed the collections of T. racemifera under Clidemia; the floral features indicate that the present generic disposition is better.

CLIDEMIA CUATRECASASII Wurdack, sp. nov.

C. densiflorae (Standl.) Gleason affinis, ramis dense setosis foliis distincte crenulato-serrulatis longe 5-pseudo-plinervatis bracteolis calycis dentibus exterioribus petalisque longioribus differt.

Ramuli primum obscure quadrangulati mox teretes sicut petioli primum dense deflexo-setosi (pilis 2-3 mm longis obscure sparseque asperis) et dense pilis clavulatis 0.1-0.3 mm longis asperis induti. Folia in quoque pari in dimensionibus plerumque disparilia (1.5-4: 1); petioli ca 0.5 cm longi; lamina 18-27 X 7-14 cm vel 7-14 X 2.5-6 cm elliptica vel obovato-elliptica apice subgradatim per 1-3 cm hebeti-acuminato basi rotundato-obtusa, chartacea et crenulato-serrulata, supra primum aspero-setulosa mox glabrata, subtus secus venas primarias praecipue basin versus sparse vel modice setosa pilis 1-2(-3) mm longis et sicut venis secundariis modice vel dense pilis subpinoideis 0.1-0.3(-0.5) mm longis setulosa in superficie glabra, breviter (0.5-2 cm) 5-plinervata pari interiore ca 1-2 cm ad costam paralleli nervis secundariis ca 5-9 mm inter se distantibus nervulis subtus planis areolis ca 0.5-0.8 mm latis. Flores 4-meri in foliorum superiorum axillis glomerati, pedicellis supra bracteolas 0.5-1 mm longis, bracteolis 6-7 X 0.4-0.6 mm subulatis setulosis persistentibus. Hypanthium (ad torum) 2.5 mm longum extus pilis stellulato-pinoideis 0.1-0.2 mm longis dense indutum et circum torum modice setulosum pilis ca 1 mm longis; calycis tubus 0.1-0.3 mm longus, lobis interioribus 1-1.2 mm longis ovato-oblongis obtusis intus resinoso-granulosis, dentibus exterioribus setulosis ca 1 mm eminentibus; torus intus dense glanduloso-setulosus (0.1-0.15 mm). Petala glabra 3-3.5 X 0.6-0.8 mm oblonga apice rotundato. Stamina isomorphica; filamenta ca 1.6 mm longa glabra; antherarum thecae 1.3 X 0.4 X 0.4 mm oblongae poro 0.2-0.25 mm diam. dorsaliter inclinato; connectivum paulo (0.1-0.15 mm) prolongatum, dorsaliter ad basin dente acuto descendenti glanduloso-ciliolato 0.4-0.6 mm longo armatum. Stigma vix expansum 0.2-0.25 mm diam.; stylus 6-6.5 X 0.15-0.2 mm glaber; ovarium 4-loculare et 3/4 inferum, cono 0.3-0.5 mm alto glandulis 0.1 mm longis modice coronato.

Type Collection: J. Cuatrecasas 13957 (holotype US 291103; isotype NY), collected at Puerto Merisalle, Río Naya, Depto. del Valle, Colombia, elev. 3-40 m, 10 Feb. 1943. "Frútex alto; cáliz verde interiormente, ext. parvusco; pétalos agudos blancos; baya anaranjada."

Paratypes (all Valle, Colombia): Killip 5114 (NY, US), from Cordoba, Dagua Valley, elev. 90-100 m; Killip & García 13201 (NY, US), from 18 km east of Buenaventura, elev. 50 m; Cuatrecasas 16443 (NY, US), from La Trojita, Río Calima, elev. 9-50 m; Cuatrecasas 21023 (NY), from El Tambo, Quebrada de Santa Ana, Buenaventura, elev. 20-30 m ("Frútex ramoso scandens. Hoja rígida, membranosa verde oscura, brillante has, grisáceo clara envés. Cáliz verde claro. Pétalos blancos").

The suggested relative has branchlets with only subclavate hairs 0.1-0.3 mm long, essentially entire 3-nerved leaves, bracteoles only 2.5-3 mm long, external calyx teeth projecting 0.1-0.2 mm, and petals 2.5-2.6 mm long, but similar interior calyx lobes, stamens, and pistil. The aspect of C. cuatrecasasii suggests that of C. chocoensis Wurdack, which has finer and shorter cauline hairs, smaller bracteoles, and 5-merous flowers with smaller petals. Most of the collections of C. cuatrecasasii had been originally distributed as Conostegia dentata Triana.

CLIDEMIA CURSORIS Wurdack subsp. ANGUSTIFOLIA Wurdack, subsp. nov.

A subspecies typica foliis angustioribus trinervatis differt.

Type Collection: R. Liesner, A. González, & R. F. Smith 2542 (holotype US 2910803; isotypes MO, VEN), collected in forest on Rio San Buena 10 km west of La Fundación, 7° 47'-48' N, 71° 46'-47' W, Edo. Táchira, Venezuela, elev. 700-1000 m, 13-15 March 1980. "Shrub 0.4 m. Sepals green or red inside; petals white."

The typical subspecies has 5-nerved leaf blades mostly 2-3 cm wide and with length/width ratio 2.4-4, while the new subspecies has leaf blades about 1 cm wide and with length/width ratio 8-13. Despite the striking foliar difference, the two taxa are alike qualitatively in vegetative features and there are no inflorescence or floral differences. The typical subspecies has recently been collected in Táchira at Cerro Las Minas 18-20 km southeast of Santa Ana, elev. 1150-1380 m (Steyermark et al 119829 and 120036).

HENRIETTELLA PRANCEI Wurdack, Phytologia 24: 206. 1972.

A recent collection (Madison, Kennedy, Monteiro, & Bragg 6067, Rio Curicuriari, Amazonas, Brazil) with abundant flowers showed a dominance of 5-merous (11 flowers 5-merous; 3 flowers 4-merous). Reexamination of the holotype (US) showed two visible 5-merous flowers; the original dissections were of three 4-merous flowers. The undescribed Venezuelan melastome mentioned under Loreya (Flora de Venezuela 3: 653. 1973) is H. prancei, now known in Territorio Amazonas from Caño Pimichin (Bunting, Akkermans, & Van Rooden 4072; Maguire, Wurdack, & Bunting 36375) and Caño Temi

near Yavita (Ll. Williams 14073; Wurdack & Adderley 42882; Steyermark & Bunting 102948); all the Venezuelan collections are in fruit.

BLAKEA POLYANTHA Wurdack, sp. nov.

B. allotrichae Uribe affinis, foliorum petiolis sparsiuscule setis robustis indutis laminis subtus secus venas primarias esetosis bracteais latoribus floribus paulo maioribus differt.

Ramuli robusti teretes sicut petioli pilis compressis robustis usque ad 10 X 1 mm sparse induti; nodi processibus stipuliformibus hyalinis demum laceratis deciduis usque ad 4 X 2 cm armati. Petioli 16-18 cm longi sicut laminarum venae primariae subtus pedicelli hypanthiaque subtiliter pube subamorpho-arachnoidea arcate appressa induti; lamina 33-40 X 25-29 cm late elliptico-ovata apice per ca 2 cm abrupte caudato-acuminato basi rotundato-truncata vel paulo (usque ad 1 cm) cordata, chartacea et crenulate-serrulata, supra glabra, subtus in superficie (glandulis minutis sparsis exceptis) glabra, 9-pseudoplinervata (nervis ad basim usque ad 2 cm coalitis) nervis secundariis 3-4 mm inter se distantibus nervis tertiariis paulo evolutis. Flores ca 30 in quoque node; pedicelli 15-20 mm longi esetosi vel apicem versus setis paucis adscendentibus armati; bractae liberae exteriores 20-23 X 7 mm interiores 17-19 X 7 mm lanceatae acuminate extus dense incurvo-setosae (pilis 2-3 mm longis ad apicem fimbriatis) intus sparse (basim versus) vel dense (apicem versus) strigosae (pilis 1-2 mm longis). Hypanthium (ad torum) 4 mm longum extus sparsiuscule strigulosum ad basim processibus hyalinis usque ad 3-3.5 X 2-3 mm fimbriatis subtentum; calycis tubus ca 1 mm longus, lobis ca 1-1.2 mm longis remotis setulosus. Petala 15-16 X 9.5-10 mm obovato-oblonga apice late obtuso et mucronulato glanduloso-ciliolata alioqui glabra. Filamenta 5 mm longa; thecae 3.7 X 1.8 X 1.2 mm lateraliter cohaerentes minute biporosae; connectivum ad basim dorsaliter dente oblongo rotundato 0.3-0.4 mm longo descendenti armatum. Stigma elongato-capitatum ca 2 X 1.4 mm; stylus 14 X 0.9 mm modice glandulosus (0.1 mm) in ovarii collo ca 1.5-2 mm immersus; ovarium 6-loculare, collo setis paucis robustis glanduliferis 4-6 mm longis coronato.

Type Collection: M. T. Madison & L. Besse 7269 (holotype US 2862587, 2862588; isotype SEL), collected in wet montane forest near El Pailon, ca 45 km below Maldonado on a path to Tobar Donose, Prov. Carchi, Ecuador, elev. 800 m, 2 Dec. 1979. "Shrub to 4 m tall, sparingly branched. Leaves dull dark green above, paler below. Calyx brown; corolla white."

The suggested Colombian relative has petioles adaxially densely setose with robust hairs and abaxially (as the primary leaf veins beneath) densely setose with fine apically fimbriate hairs, bracts 2-3 mm wide, petals 12-13 mm long, and bluntly acute connective calcar 0.5-0.8 mm long; in other qualitative floral details, the two taxa are alike. In the treatment of *Blakea* for Ecuador, *B. polyantha* would be placed near *B. jativae* Wurdack or perhaps *B. eriocalyx* Wurdack, both of which are not

as closely related as B. allotricha.

TOPOBEA CAUDATA Wurdack, sp. nov.

T. alternifoliae Gleason, T. reductae Gleason, et T. dodsonorum Wurdack in floribus affinis, foliis in quoque pari essentialiter isomorphice differt.

Ramuli primum paulo compressi demum teretes sicut folia bracteae hypanthia calyxque primum modice subpinoideo-pulverulenti (indumento arcte appresso pilis ca 0.05-0.1 mm diam.) glabrata. Petioli 1-1.5 cm longi; lamina (5-)7-11 X (4-)5-6.5 cm elliptica apice abrupte 1-2 cm caudato-acuminato basi late acuta vel anguste obtusa, firme chartacea et integra, 5-nervata (pari inframarginali tenui excluso) pari interiore et costa subtus per 0.5-1 cm punctato-coarctato nervis secundariis 0.7-1 mm inter se distantibus. Flores in quoque nodo superiore duo; pedicelli 8-12 mm longi; bracteae liberae subrigidae; bracteae exteriores 6-7 X 2.5-3 mm oblongo-lanceolatae acutae hypanthium aequantes vel paulo breviores; bracteae interiores 4-5.5 X 3-3.6 mm oblongo-ellipticae apice obtuso vel late acuto. Hypanthium (ad torum) 5 mm longum paullulo costulatum; calycis tubus 1 mm longus, lobis 3-3.2 X 2 mm ad basim remotis oblongis hebeti-acutis. Petala glabra 8-8.5 X 4.5 mm oblongo-ovata apice late obtuso vel subtruncato. Filamenta 3.7 mm longa; antherae 2.5-2.6 X 1 mm lateraliter non cohaerentes, poro dorsaliter inclinato; connectivi appendice dorso-basali apiculato ca 0.3 mm eminente. Stigma vix expansum 0.4 mm diam.; stylus glaber 0.6-0.3 mm; ovarium 4.5 mm inferum; conus cylindricus 1.5 mm altus glaber, collo non vel vix (0.2 mm) evoluto.

Type Collection: M. T. Madison & L. Besse 6291 (holotype US 2862583; isotype SEL), collected in wet montane forest near El Pailon ca 45 km below Maldonado along path to Tobar Donoso, Prov. Carchi, Ecuador, elev. 800 m, 26 Nov. 1979. "Shrub 3 m tall; leaves shiny above and dull below. Flower waxy dark yellow-green."

All three suggested relatives have very anisomorphic leaf pairs, as well as shorter floral bracts (to 3 mm long). The vegetative aspect of T. caudata is like that of T. pittieri Cogn.; however, that wide-ranging species has smaller floral bracts, truncate calyx limb, and larger petals and anthers. In the Flora of Ecuador, T. caudata would key to near T. dodsonorum.

TOPOBEA MODICA Wurdack, sp. nov.

T. inflatae Triana affinis, ramulorum nodis non inflatis calycis dentibus exterioribus brevioribus ovarii collo non evoluto differt.

Ramuli primum obscure obtuseque tetragoni mox teretes, internodiis glabris, nodis primum appresso-setulosus (0.7 mm) mox glabratis; linea interpetiolaris evoluta ca 0.2 mm alta. Petioli 1.5-2 cm longi glabri; lamina (6-)7-10(-12) X 4-6.5 cm obovato-elliptica vel elliptica apice breviter (0.3-0.6 cm) abrupteque hebeti-acuminato basi acuta et adaxialiter paulo bitumida, supra primum ad basim ipsam obscure barbellata mox glabrata alioqui

glabra, subtus in venarum primariarum axillis dense setulosa (0.5-1 mm) alioqui glabra, 5-nervata pari exteriori ca 1.5-2 mm inframarginali nervis secundariis 0.7-1 mm inter se distantibus. Flores in quoque nodo superiore 6(-8), pedicellis ad anthesim 1.5-2 cm longis sicut bracteis hypanthiis calycibusque glabris; bracteae exteriores 5 X 4.8 mm suborbiculari-oblongae obtusae apiculatae ad basim ca 2 mm coalitae quam hypanthio dimidio breviores; bracteae interiores usque ad basim liberae 4.5 X 5 mm oblongo-suborbitales apice paulo emarginato et apiculato. Hypanthium 6 mm longum teres; calyx 3 mm longus essentialiter truncatus, dentibus exterioribus ca 0.5 mm longis et 0.2 mm eminentibus. Petala glabra 21-23 X 10-11 mm obovato-rhomboidae apice late hebeti-acuto vel anguste hebeti-obtuso. Filamenta 8.5 mm longa; thecae 8 X 1.4 X 1.1 mm anguste oblongae poro 0.6 mm diam. dorsaliter inclinato; connectivi dens dorsalis 3 mm longus acutus descendens. Stigma non expansum 0.6 mm diam.; stylus 18 X 0.8-0.55 mm glaber; ovarium 6-loculare et 2.2 mm adhaerens, cono 3 mm alto glabro truncato (collo non evoluti).

Type Collection: M. T. Madison & L. Besse 7095 (holotype SEL; isotype US), collected at wet montane forest and stream margins near El Pailon, ca 45 km below Maldonado along path to Tobar Donoso, Prov. Carchi, Ecuador, elev. 800 m, 28 Nov. 1979. "Tree 6 m tall. Leaves shiny on both sides. Calyx green; petals pink, white at base; filaments white, anthers yellow."

Topobea inflata (cf. Caldasia 11: 86. 1971) has many inflated branchlet internodes, exterior calyx teeth 1.2-1.5 mm long and projecting ca 1 mm, and a developed lobulate ovary collar ca 1 mm long; in other vegetative and floral details the two species are alike. Other relatives include T. calycularis Naud. (bracts and the relatively wider petals densely fringed, anther connective tooth ca 0.1 mm long) and T. calcarata Uribe (leaf blades lacking dense setula tufts in the primary vein axils beneath, bracts and hypanthia larger, petals relatively wider, anther connective appendage 4.5-4.8 mm long and rather thick). In the Flora of Ecuador, T. modica would key to near T. subscaberula Triana (with broader spacing of leaf secondary veins, deciduous pinoid hairs, shorter petals and anthers, and blunt connective tooth 0.25 mm long).

NOTES ON NEW AND NOTEWORTHY PLANTS. CXLV

Harold N. Moldenke

ERIOCAULON AQUATILE var. *LATIFOLIUM* Mold., var. nov.

Haec varietas a forma typica speciei foliis perspicue latioribus plerumque 3 mm. latis recedit.

This variety differs from the typical form of the species in having its leaves apparently all much broader, rather uniformly 3 mm. wide except for the elongate narrowly attenuated apical portions.

The type of the variety was collected by B. Rabledo (no. 6) at "margem alagada de igarapé, Acampamento Henrique - BR 156", somewhere in Brazil, and is also no. 6 in the Catálogo Geral of the Museu M. Costa Lima, deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes "Erva acaule. Capítulos esbranquiçados. Planta submersa".

ERIOCAULON SINGULARE Mold., sp. nov.

Herba perennis foliis radicalibus erecto-ascendentibus herbaceis ca. 40 cm. longis basaliter 4 cm. latis glaberrimis, inflorescentiis globosis albis multicapitatis, capitulis sessilibus.

A large perennial herb; leaves basal, large, herbaceous, not very rigid, erecto-ascending, about 40 cm. long and basally 4 cm. wide when mature, glabrous on both surfaces, basally fenestrate, apically rather obtuse, more or less equitant toward the base and often conduplicate upwards; peduncles about 5 per plant, erect, surpassing the leaves, often to almost 1 m. long, stramineous, very shiny, glabrous or only microscopically appressed-puberulous, many-striate; sheath elongate, rather lax, about 36 cm. long, glabrous or practically so, apically obliquely split, the limb very short and rounded or subtruncate; heads numerous, sessile at the apex of the peduncle and crowded together so tightly as to form what appears at first glance to be a single large globose white head; for bract and floret dimensions and other characters see accompanying Fig. 1. Explanation of the figure: A -- Habit, B - Flower-head showing compound nature, C - Involucral bracts, D - Receptacular bracts, E - Staminate floret, F - Staminate floret, sepals removed, corolla-tube laid open, G - Pistillate floret. Drawing by A. H. M. Jayasuriya.

This amazing species -- the only one known to me in this genus with a compound flowering-head -- is based on *A. Maceã* 2589 from campestre do brejo, La Serra do Conego, Minas Gerais, Brazil, collected on September 16, 1950, deposited in the Britton Herbarium at the New York Botanical Garden. It has hitherto been confused with and reported by me as *E. macrobolax* Mart., which it closely resembles in habit, but which neither Martius nor Ruhland describes as having compound heads, a character which they surely would not have overlooked.

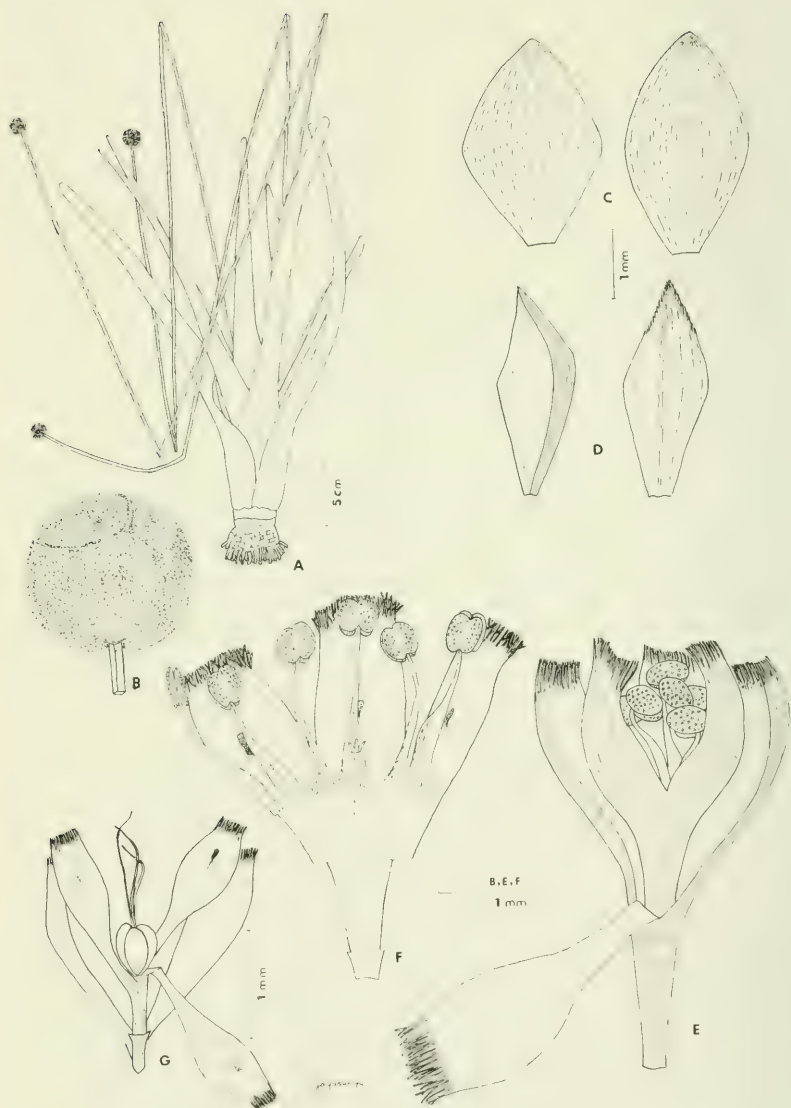


Figure 1. *Eriocaulon singulare* Mold.

STACHYTARPHETA BICOLOR f. *PILOSULA* Mold., f. nov.

Haec forma a forma typica speciei caulibus foliisque inflorescentiisque parce pilosulis recedit.

This form differs from the typical form of the species in having its stems, branches, leaves, and inflorescences sparsely pilosulous throughout.

The form is based on *André M. de Carvalho & Pessôal do Projeto Flora "Pedra do Cavalo" 539* from a gallery forest on the margin of the Rio Paraguaçu, 12°32'35" S. and 39° 3'6" W., in the Município de Conceição de Feira, Bahia, Brazil, collected on February 17, 1981, and deposited in my personal herbarium. The collectors describe the plant as a subshrub, about 1 m. tall, the leaves bicolorous, the flowers handsome, the corollas cobalt-blue, whitish on the interior of the tube.

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ADDITIONAL NOTES ON THE GENUS *LIPPIA*. XVII

Harold N. Moldenke

LIPPIA PALMERI S. Wats.

Additional bibliography: Anon., Biol. Abstr. 68: 3939. 1979; Hocking, Excerpt. Bot. A.33: 88. 1979; Mold., Phytologia 41: 148 (1979) and 44: 328. 1979; Mold., Phytol. Mem. 2: 65, 70, 421, & 561. 1980; Wiggins, Fl. Baja Calif. 530 & [531], fig. 499. 1980; Mold., Phytologia 48: 185. 1981.

Additional illustrations: Wiggins, Fl. Baja Calif. [531], fig. 499. 1980.

Recent collectors describe this plant as a shrub, 1--1.5 m. tall, the leaves sweet (minty)-scented, and have found it growing in rocky arroyos and on rocky mountains along with *Cereus*, *Bursera*, *Larrea*, and *Fouquieria*, at 50 m. altitude, flowering in February. The corollas are said to have been "cream, orange in tube" on *Spellenberg & Spellenberg 4959* and "white" on *Moran & Reveal 20085*. Moran & Reveal refer to it as "occasional".

The *Carter & Ferris 4044* previously cited by me as the typical form of the species, seems better (at least insofar as the Britton Herbarium specimen) regarded as f. *spicata*.

Additional citations: MEXICO: Baja California: *Moran & Reveal 20085* (Ld). Sonora: *Spellenberg & Spellenberg 4959* (N).

LIPPIA PALMERI f. *SPICATA* (Rose) Mold., Phytologia 44: 328. 1979.

Additional bibliography: Mold., Phytologia 39: 391--392 (1978) and 44: 328. 1979; Mold., Phytol. Mem. 2: 65, 70, 421, & 561. 1980; Wiggins, Fl. Baja Calif. 530. 1980.

Recent collectors have encountered this plant growing on slopes with *Lysiloma candida*, *Mimosa purpurascens*, *Jatropha cinerea*, *Sapium biloculare*, *Jacquemontia*, and *Ruellia*, at 600 m. altitude, describing it as a slender, erect shrub, to 1.5 m. tall, and reporting the vernacular name, "orégano". They have found it in anthesis in March. The corollas are said to have been "white to

pale-lavender" on Carter & Ferris 4044, a collection distributed as and previously cited by me as typical *L. palmeri* S. Wats., but at least the Britton Herbarium specimen of it is better regarded as the present not-too-well marked form.

Additional & emended citations: MEXICO: Baja California: Carter & Ferris 4044 (Au--271014, Ca--199584, Gg, N).

LIPPIA PEARSONI Mold.

Additional bibliography: Mold., Phytologia 39: 392--393 (1978) and 40: 203. 1978; Mold., Phytol. Mem. 2: 234, 246, & 561. 1980.

LIPPIA PEARSONI var. *SESSILIS* Mold.

Additional bibliography: Mold., Phytologia 39: 393. 1978; Mold., Phytol. Mem. 2: 234 & 561. 1980

LIPPIA PEDUNCULATA H. H. W. Pearson

Additional bibliography: Mold., Phytologia 39: 393. 1978; Mold., Phytol. Mem. 2: 246 & 561. 1980.

LIPPIA PEDUNCULOSA Hayek

Additional bibliography: Mold., Phytologia 39: 393. 1978; Mold., Phytol. Mem. 2: 149 & 561. 1980.

LIPPIA PENDULA Rusby

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 40 (2): 335. 1915; Mold., Phytologia 41: 148. 1979; Mold., Phytol. Mem. 2: 149, 175, & 561. 1980.

Additional citations: BOLIVIA: La Paz: Boeke 1452 (N).

LIPPIA PETIOLATA Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.25: 379. 1975; Mold., Phytologia 39: 393. 1978; Mold., Phytol. Mem. 2: 149 & 561. 1980.

LIPPIA PHAEOCEPHALA Briq.

Additional bibliography: Mold., Phytologia 39: 393--394. 1978; Mold., Phytol. Mem. 2: 178, 180, & 561. 1980.

LIPPIA PHRYXOCALYX Briq.

Additional bibliography: Mold., Phytologia 39: 394. 1978; Mold., Phytol. Mem. 2: 149, 178, & 562. 1980.

LIPPIA PLICATA J. G. Baker

Additional & emended bibliography: R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Exped. Bot. 2 (2): 273. 1916; Good & Exell, Journ. Bot. 68: Suppl. 2: 139--140. 1930; Mold., Phytologia 39: 394--395. 1978; Mold., Phytol. Mem. 2: 220, 222, 227, 234, 236, 239, 241, & 562. 1980.

Fries (1916) comments that "Die Art ist bisher nur von Fwanbo (in Urungu etwas südlich vom Tanganyika) angegeben, wo sie von Carson gesammelt wurde (n. 81). Dieses Exemplar habe ich in Kew Herbarium gesehen und mit dem meinigen aus der Bangweolo-Gegend identisch gefunden. *Lippia plicata* scheint

jedoch in Afrika eine weite Verbreitung über die südlichen Teile der Tropen zu haben. Im Herbarium des Bot. Museums zu Berlin habe ich nämlich zwei aus Angola stammende Exemplare gefunden und zwar in Benguella auf Mount Elende von Wellman (n. 1292) und bei Malange von Gossweiler (n. 1049) gesammelt."

LIPPIA PLICATA var. *ACUMINATA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 39: 395. 1978; Mold., *Phytol. Mem.* 2: 220, 234, 241, & 562. 1980.

LIPPIA PLICATA var. *PARVIFOLIA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 39: 395. 1978; Mold., *Phytol. Mem.* 2: 220 & 562. 1980.

LIPPIA POHLIANA Schau.

Additional bibliography: Mold., *Phytologia* 39: 438--439. 1978; Hocking, *Excerpt. Bot. A.33*: 88. 1979; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA POHLIANA var. *LONGIBRACTEOLATA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 438--439. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA POLYTRICHA Briq.

Additional bibliography: Mold., *Phytologia* 39: 439. 1978; Mold., *Phytol. Mem.* 2: 178 & 562. 1980.

LIPPIA POSSENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 439. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA PRAECOX Mildbr.

Additional bibliography: Mold., *Phytologia* 39: 439. 1978; Mold., *Phytol. Mem.* 2: 239 & 562. 1980.

LIPPIA PRETORIENSIS H. H. W. Pearson

Additional bibliography: Mold., *Phytologia* 39: 439--440 & 447 (1978) and 40: 203 & 204. 1978; Mold., *Phytol. Mem.* 2: 246 & 562. 1980.

LIPPIA PRIMULINA S. Moore

Additional bibliography: Mold., *Phytologia* 39: 440. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA PRIMULINA var. *GOYAZENSIS* S. Moore

Additional bibliography: Mold., *Phytologia* 39: 440. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA PRINGLEI Briq.

Additional & emended bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 39 (2): 320. 1913; H. N. & A. L. Mold., *Pl. Life* 2: 51, 66, & 77. 1948; Mold., *Phytologia* 41: 149 & 151. 1979; Mold., *Phytol. Mem.* 2: 65, 357, & 562. 1980.

Recent collectors describe this plant as a shrub or tree, 3.5-7 m. tall, with a single trunk, the fruit "café", and have found it at 400--1350 m. altitude, in flower in March and November and both in flower and fruit in December and February. The corollas are said to have been "yellowish" on *Kinnach & Sanchez-Mejorada 2037 & 2244* and "rose" on *Delgadillo M. 209*.

The *Calzada 2170*, distributed as *L. umbellata* Cav. and previously cited by me as *L. pringlei*, actually seems to represent *Lippia torresii* Standl.

Additional citations: MEXICO: Morelos: *Miranda 1193* (Me--73562), 9322 (Me--74569). Oaxaca: *Delgadillo M. 209* (Me--229112), 220 (Me--229650); *Miranda 1063* (Me--73563). Sinaloa: *Kinnach & Sanchez-Mejorada 2037* (W--2904483), 2244 (W--2904475).

LIPPIA PRINGLEI var. *INTECTA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 443. 1978; Mold., *Phytol. Mem.* 2: 65 & 562. 1980.

LIPPIA PSEUDO-THEA (A. St.-Hil.) Schau.

Additional bibliography: Stapf, *Ind. Lond.* 4: 39. 1930; Angely, *Bot. Aplic. Farm.* 267, 297, & 307. 1958; Imbesi, *Ind. Piante* 450. 1964; Mold., *Phytologia* 41: 149 (1979) and 43: 295. 1979; Mold., *Phytol. Mem.* 2: 149, 417, & 562. 1980.

Angely (1958) reports the local vernacular names, "chá de frade", "chá de pedestre", and "capitão do mato" and states that in Brazil the leaves and tops of the shoots of this plant are employed medicinally.

Additional citations: BRAZIL: Minas Gerais: *Hatschbach 30140* (Id).

LIPPIA PUMILA Cham.

Additional bibliography: Mold., *Phytologia* 39: 444--445. 1978; Mold., *Phytol. Mem.* 2: 149, 421, & 562. 1980.

LIPPIA RADULA J. G. Baker

Additional bibliography: Mold., *Phytologia* 39: 445. 1978; Mold., *Phytol. Mem.* 2: 231 & 562. 1980.

LIPPIA RAMBOI Mold.

Additional bibliography: Mold., *Phytologia* 39: 445. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA RAMBOI var. *PILOSA* Mold.

Additional bibliography: Mold., *Phytologia* 39: 445. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA RECOLLETAE Morong

Additional bibliography: Mold., *Phytologia* 39: 445--446 (1978) and 40: 70. 1978; Mold., *Phytol. Mem.* 2: 149, 175, 178, 189, 421, & 562. 1980.

Additional citations: PARAGUAY: *Arbo, Tressens, Schinini, & Ferrucci 1939* (N); *Sparre & Vervoorst 943* (N).

LIPPIA RECOLLETAE var. *PICKELII* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 39: 446. 1978; Mold., *Phytol. Mem.* 2: 178 & 562. 1980.

LIPPIA REHMANNI H. H. W. Pearson

Additional bibliography: Mold., *Phytologia* 39: 439 & 446--447 (1978) and 40: 59, 203, & 204. 1978; Mold., *Phytol. Mem.* 2: 220, 243, 244, 246, & 562. 1980.

LIPPIA RETICULATA Hayek

Additional bibliography: Mold., *Phytologia* 39: 448. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA RHODOCNEMIS Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 39: 448 (1978) and 43: 295. 1979.

Additional citations: BRAZIL: Minas Gerais: Irwin, Fonseca, Souza, Reis dos Santos, & Ramos 28507 (N).

LIPPIA RIEDELIANA Schau.

Additional bibliography: Mold., *Phytologia* 39: 448. 1978; Mold., *Phytol. Mem.* 2: 149, 421, & 562. 1980.

LIPPIA RIGIDA Schau.

Additional bibliography: Mold., *Phytologia* 39: 448--449. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

LIPPIA RIVALIS Mold., *Phytologia* 45: 37--38. 1980.

Bibliography: Mold., *Phytologia* 45: 37--38. 1980; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

Citations: BRAZIL: Bahia: Hatschbach 42128 (Z--type).

LIPPIA RODRIGUEZII Mold.

Additional bibliography: Mold., *Phytologia* 39: 449. 1978; Mold., *Phytol. Mem.* 2: 189 & 562. 1980.

LIPPIA RONDONENSIS Mold.

Additional bibliography: Mold., *Phytologia* 39: 449. 1978; Mold., *Phytol. Mem.* 2: 134, 149, 175, & 562. 1980.

Recent collectors describe this plant as an herb, 1 m. tall, or as a shrub, 2 m. tall, fragrant, used medicinally against colic in Peru, where it is called "quiche oregano", and found it growing in fields and cultivated areas, flowering in January. The corollas are said to have been "pale-purple with a yellow center" on Prance & Ramos 23627 and these collectors note that it is used as an admixture with *Justicia pectoralis* in Virola snuff, used in this way by all the Tototobi Amerinds, who call it "cedrera" or "makiupa-hanak".

The species is obviously very closely related to or a derivative of the very variable *L. alba* (Mill.) N. E. Br.

Material of *L. rondonensis* has been misidentified and distributed in some herbaria as "*Labiatae*".

Additional citations: PERU: Huánuco: *Schanke Vigo 1522* (W--2865161). BRAZIL: Acre: *Santos, Mota, & Ramos 90* (Z). Amazonas: *Prance & Ramos 23627* (Z).

LIPPIA ROSELLA Mold.

Additional bibliography: Mold., *Phytologia* 39: 437 & 449--450. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA ROSMARINIFOLIA Anderss.

Additional synonymy: *Lippia rosmarinifolia* Anders. ex López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28, sphalm. 1979.

Additional bibliography: López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytologia* 41: 149 (1979) and 44: 384. 1979; Mold., *Phytol. Mem.* 2: 130, 422, & 562. 1980.

LIPPIA ROSMARINIFOLIA f. *LATIFOLIA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 39: 451 (1978) and 44: 384. 1979; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytol. Mem.* 2: 130, 421, & 562. 1980.

Werff found this plant growing on the vertical walls of a volcano crater, at 2400 feet altitude, flowering in September, and describes it as a shrub, the leaves entire or incised, and the "flowers" [corollas] yellow and fragrant.

Additional citations: GALAPAGOS ISLANDS: Santiago: *Werff 2345* (N).

LIPPIA ROSMARINIFOLIA f. *STEWARTII* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 41: 149. 1979; Mold., *Phytol. Mem.* 2: 130, 421, 422, & 562. 1980.

LIPPIA ROTUNDIFOLIA Cham.

Additional bibliography: Mold., *Phytologia* 39: 452--453. 1978; Mold., *Phytol. Mem.* 2: 149 & 562. 1980.

LIPPIA RUBIGINOSA Schau.

Additional bibliography: Mold., *Phytologia* 39: 453. 1978; Mold., *Phytol. Mem.* 2: 149 & 562.

LIPPIA RUGOSA A. Chev.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 39 (2): 320. 1913; Mold., *Phytologia* 39: 453--454. 1978; Mold., *Phytol. Mem.* 2: 207, 213, 214, & 562. 1980; Mold., *Phytologia* 48: 155. 1981.

LIPPIA RZEDOWSKII Mold.

Additional bibliography: Mold., *Phytologia* 39: 454. 1978; Mold., *Phytol. Mem.* 2: 65 & 562. 1980.

LIPPIA SALAMENSIS Loes.

Additional bibliography: Mold., *Phytologia* 39: 442 & 454. 1978; Mold., *Phytol. Mem.* 2: 72 & 562. 1980.

LIPPIA SALICIFOLIA Anderss.

Additional bibliography: Mold., *Phytologia* 39: 454. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytol. Mem.* 2: 130 & 562. 1980.

LIPPIA SALSA Griseb.

Additional bibliography: Mold., *Phytologia* 41: 150. 1979; Mold., *Phytol. Mem.* 2: 189 & 562. 1980.

Burkart refers to this plant as an abundant shrub, to 1.2 m. tall, in saline areas of Santiago del Estero, Argentina. The corollas are said to have been "light-blue" on Botta & Guoglio-none 828 and "blanca, lilacina antes de abrir" on Burkart 30600.

Additional citations: ARGENTINA: Catamarca: Botta & Guoglio-none 828 (Go). Santiago del Estero: Burkart 30600 (Au); Cabrera, Botta, Ezcurra, Mulgura, & Ragonese 29678 (W--2893722).

LIPPIA SALVIAEFOLIA Cham.

Additional bibliography: Mold., *Phytologia* 41: 150. 1979; Mold., *Phytol. Mem.* 2: 149, 175, 178, 189, & 562. 1980.

Recent collectors describe this plant as a shrub, 2 m. tall,, and have found it growing in cerrado, at 900 m. altitude, in anthesis in February and April. The corollas are said to have been "white" on Macedo 5281, Schaller 103, and Shepherd & al. 7308.

Additional citations: BRAZIL: Mato Grosso: Schaller 103 (N). Minas Gerais: Armando & Rizzini 5 (N); Irwin, Fonsêca, Souza, Reis dos Santos, & Ramos 28042 (N); Macedo 5281 (Eu--53633). São Paulo: Shepherd, Semir, Andrade, & Salgado 7308 (W--2883666).

LIPPIA SANDWITTHIANA Mold.

Additional bibliography: Mold., *Phytologia* 39: 456. 1978; Mold., *Phytol. Mem.* 2: 178 & 562. 1980.

LIPPIA SATUREIAEFOLIA Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 39: 456. 1978; Mold., *Phytol. Mem.* 2: 149, 422, & 562. 1980.

Recent collectors refer to this species as a scandent shrub and have encountered it on campo rupestre, at 1000 m. altitude, flowering in July. The corollas are said to have been "reddish" on the collection cited below.

Additional citations: BRAZIL: Bahia: Mori, King, Santos, & Hage 12318 (W--2854247, Z).

LIPPIA SAVORYI Meikle

Additional bibliography: Mold., *Phytologia* 40: 58. 1978; Hocking, *Excerpt. Bot. A.33*: 88. 1979; Mold., *Phytol. Mem.* 2: 211, 213, 220, 234, & 562. 1980.

LIPPIA SCABERRIMA Sond.

Additional bibliography: Dithens, *Afric. Handb.* 8: [Drug Pl. Afr.] 94. 1949; Mold., *Phytologia* 41: 150. 1979; Mold., *Phytol. Mem.* 2: 243, 246, 422, & 562. 1980; Mold., *Phytologia* 48: 176. 1981.

Dahlstrand has encountered this plant growing in roadcuts, at 1200--1600 m. altitude, flowering and fruiting in January.

Additional citations: SOUTH AFRICA: Transvaal: *Dahlstrand* 442 (Go), 1133 (Go).

LIPPIA SCAPOSA Briq.

Additional bibliography: Mold., *Phytologia* 40: 59. 1978; Mold., *Phytol. Mem.* 2: 178 & 562. 1980.

LIPPIA SCAPOSA var. *MELANOCAULOS* Briq.

Additional bibliography: Mold., *Phytologia* 40: 59. 1978; Mold., *Phytol. Mem.* 2: 178 & 562. 1980.

LIPPIA SCHAUERIANA Mart.

Additional bibliography: Mold., *Phytologia* 40: 59. 1978; Mold., *Phytol. Mem.* 2: 149, 422, & 562. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

Harley and his associates describe this species as a spindly shrub, to 2.5 m. tall, the leaves aromatic, rugose, pale-green above, grayish-green beneath, the bracts pale-green, and the corolla "pink", and have found it growing among rocks in cerrado in an area of rocky riversides with rapids, riverine vegetation, cerrado with limestone outcrops, and some grassland subject to flooding, at 980 m. altitude, flowering in March.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro in Harley 20147* (N, Z).

LIPPIA SCHLIEBENI Mold.

Additional bibliography: Mold., *Phytologia* 40: 60 & 80. 1978; Mold., *Phytol. Mem.* 2: 220, 227, 231, 422, & 562. 1980.

LIPPIA SCHLIMII Turcz.

Additional bibliography: López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytologia* 41: 150--151. 1979; Mold., *Phytol. Mem.* 2: 109, 116, 422, & 562. 1980.

López-Palacios (1979) records the variant vernacular name, "sacacandela", for this species.

LIPPIA SCHLIMII var. *GLABRESCENS* (Mold.) Mold.

Emended synonymy: *Lippia floribunda* Humb. & Bonpl. apud Steud., *Nom. Bot. Phan.*, ed. 1, 485. 1821.

Additional bibliography: Steud., *Nom. Bot. Phan.*, ed. 1, 485 (1821) and ed. 2, 2: 54. 1841; D. Dietr., *Syn. Pl.* 3: 599. 1843; Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 603. 1927; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 28. 1979; Mold., *Phytologia* 41: 150--151. 1979; Mold., *Phytol. Mem.* 2: 109, 116, 357, 420, 422, & 562. 1980.

Recent collectors describe this plant as a shrub, 2 m. tall, or a tree, 4--10 m. tall, the leaves aromatic, shiny, rugose, gray-green or sometimes dark- or brilliant-green above and dull-green beneath, rather rigid but fragile, the floral bracts pale-green, and have encountered it on wet forested slopes and steep slopes along streams, at 1650--3530 m. altitude, flowering in June, July, September, and October. Luteyn and his associates report it "common on forested slopes in montane cloud forests".

The corollas are said to have been "white" on *Cuatrecasas* 20753, *Cuatrecasas & Rodriguez* 27934 & 27972, *Steyermark & Liesner* 118550, and *Trujillo* 8170 and "greenish-white" on *Steyermark & Liesner* 118230. *Cuatrecasas* refers to the leaves on his no. 20753 being "amarillento-oscuro". He and *Rodriguez* refer to the inflorescences as "pale-grayish" or "greenish-white and the corollas themselves as "white". The flowering heads are unusually large on *Cuatrecasas & Rodriguez* 27838. A vernacular name recorded for the plant is "salvia".

Knuth (1927) cites *Linden* 341 from Mérida and Trujillo, Venezuela.

Additional citations: COLOMBIA: Boyacá: *Cuatrecasas & Rodriguez* 27838 (W--2616135). Norte de Santander: *Cuatrecasas & Rodriguez* 27934 (W--2616159). Norte de Santander/Cesar: *Cuatrecasas & Rodriguez* 27972 (W--2616190). Valle del Cauca: *Cuatrecasas* 20753 (W--2817820). VENEZUELA: Mérida: *Trujillo* 8170 (Eu--47847). Táchira: *Luteyn, Luteyn, & Ruiz-Teran* 5994 (N); *Steyermark & Liesner* 118230 (Ld), 118550 (Ld).

LIPPIA SCHOMBURGKIANA Schau.

Additional bibliography: Oliv., Trans. Linn. Soc. Lond. Bot., ser. 2, 2: 288. 1887; N. E. Br., Trans. Linn. Soc. Lond. Bot., ser. 2, 6: 57. 1901; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 603. 1927; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 28. 1979; Mold., Phytologia 41: 147 & 151. 1979; Mold., Phytol. Mem. 2: 116, 122, 149, 422, & 562. 1980; Mold. & Bromley in *Harley & Mayo*, Toward Checklist Fl. Bahia 191. 1980; Mold., Phytologia 48: 182. 1981.

Harley and his associates, distributing it as *L. microphylla* Cham., describe this plant as a spindly-stemmed shrub, 1.5--4 m. tall, with a sage-like scent, the stems slender, brittle, the leaves aromatic, rugose, rather dark-green or rich-green above, paler or gray-green beneath, the bracts pale-green, the sepals pale-green, and have found it growing "on hillside and associated rocky riverbed with sandstone rocks and some sparse forest and scrub" and in "caatinga on sand and with quartzitic rocks and metamorphosed sandstone forming rock areas with more open vegetation including extensive areas of *Vellozia*", at 400--1000 m. altitude, flowering and fruiting in February. The corollas are said to have been "white with yellowish tube and yellow in the throat" on their no. 18603, "white with orange-yellow throat" on 19011, and "cream with orange-yellow throat" on 18929.

Knuth (1927) cites *Connell & Quelch* 2, 235, & 720 and *ImThurn* 52 from the Roraima region of Venezuela.

The *Davidse, Ramia, & Montes* 4747, distributed as *L. schomburgkiana*, actually is *L. origanoides* H.B.K.

Additional citations: BRAZIL: Bahia: *Harley, Mayo, Storr, Santos, & Pinheiro* in *Harley* 18603 (Ld, N), 18929 (Ld, N), 19011 (Ld, N); *Pinheiro* 2140 (Ld); T. S. Santos 2529 (Ld).

LIPPIA SCLEROPHYLLA Briq.

Additional bibliography: Mold., Phytologia 40: 63--64. 1978; Mold., Phytol. Mem. 2: 178, 189, & 562. 1980.

LIPPIA SCLEROPHYLLA var. *LORETENSIS* Mold.

Additional bibliography: Mold., *Phytologia* 40: 64. 1978; Mold., *Phytol. Mem.* 2: 189 & 562. 1980.

LIPPIA SERICEA Cham.

Additional bibliography: Mold., *Phytologia* 40: 64--65. 1978; Mold., *Phytol. Mem.* 2: 149, 422, & 562. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, *Fonsêca*, Souza, Reis dos Santos, & Ramos 26917 (N).

LIPPIA SESSILIFLORA J. G. Baker

Additional bibliography: Mold., *Phytologia* 40: 65. 1978; Mold., *Phytol. Mem.* 2: 368 & 563. 1980.

LIPPIA SIDOIDES Cham.

Additional bibliography: Mold., *Phytologia* 40: 65--66. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

The Héringier & al. collection, cited below, was collected as voucher for phytochemical studies.

Additional citations: BRAZIL: Distrito Federal: Héringier, Elias de Paula, Cunha de Mendonça, & Héringier Salles 1242 (N). Rondônia: Vieira, Petersen, Nelson, Ramos, & Mota 1008 (N, Z).

LIPPIA SIDOIDES f. *FLACCIDA* Hayek

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 39 (2): 320. 1913; Mold., *Phytologia* 40: 66. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

LIPPIA SOMALENSIS Vatke

Additional bibliography: Chiov., *Fl. Somalia* [1]: 49. 1929; Mold., *Phytologia* 40: 66. 1978; Mold., *Phytol. Mem.* 2: 204, 231, & 563. 1980.

LIPPIA STACHYOIDES Cham.

Additional bibliography: Mold., *Phytologia* 40: 66--67. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

Additional citations: BRAZIL: Mato Grosso: Hatschbach & Koczicki 33231 (W--2839444).

LIPPIA SUBRACEMOSA Mansf.

Additional bibliography: Mold., *Phytologia* 40: 67. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

LIPPIA SUBRACEMOSA var. *HARLEYI* Mold.

Additional bibliography: Mold., *Phytologia* 40: 67. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

LIPPIA SUBSTRIGOSA Turcz.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 40 (2): 335. 1915; Mold., *Phytologia* 40: 67--70, 81, & 82. 1978; Mold., *Phytol. Mem.* 2: 65, 72, 74, 76, 78, 79, 422, & 563. 1980.

Recent collectors describe this plant as a weak shrub, 2--3 m. tall, or a small tree to 5 m. tall, and have encountered it in secondary woods of *Trema micrantha*, "common" in mixed forests, or "dominant as secondary growth following milpas", at 1300--2180 m. altitude, flowering in January and March, fruiting in January. The corollas are said to have been "yellow" on *Ton* 3661, "pale-yellow" on *Molina R.* 20433, and "yellowish" on *Molina R. & Montalvo* 21806.

Hernandez Xolocotzi asserts that the wood of this species is used for roofing material. Vernacular names reported are "orégano de árbol", "palo gusano", and "salvia". Material has been misidentified and distributed in some herbaria as *Lantana* sp.

Additional citations: MEXICO: Chiapas: *Hernandez Xolocotzi* X.1444 (Me, Me); *Miranda* 6110 (Me--71817), 6188 (Me--71812). 9164 (Me--68426); *Ton* 3661 (Ws). GUATEMALA: Guatemala: *Molina R., Burger, & Wallenta* 15987 (W--2840312). EL SALVADOR: San Salvador: *Molina R. & Montalvo* 21806 (Ws). NICARAGUA: Matagalpa: *Molina R.* 20433 (W--2866762).

LIPPIA SUFFRUTICOSA (Griseb.) Kuntze

Additional bibliography: Mold., *Phytologia* 40: 70. 1978; Mold., *Phytol. Mem.* 2: 175, 189, & 563. 1980.

LIPPIA TAYACAJANA Mold.

Additional bibliography: Mold., *Phytologia* 40: 70. 1978; Mold., *Phytol. Mem.* 2: 134 & 563. 1980.

LIPPIA TAYACAJANA var. *SESSILIFLORA* Mold.

Additional bibliography: Mold., *Phytologia* 40: 70. 1978; Mold., *Phytol. Mem.* 2: 134 & 563. 1980.

Ellenberg encountered what appears to be this plant on semi-deserts, at 3395 m. altitude.

Additional citations: PERU: Ica: *Ellenberg* 4912a (W--2852647).

LIPPIA TEGULIFERA Briq.

Additional bibliography: Mold., *Phytologia* 40: 70--71. 1978; Mold., *Phytol. Mem.* 2: 178, 189, 422, & 563. 1980.

LIPPIA TEGULIFERA var. *GRISEA* Briq.

Additional bibliography: Mold., *Phytologia* 40: 71. 1978; Mold., *Phytol. Mem.* 2: 178 & 563. 1980.

LIPPIA TEGULIFERA var. *OVATA* Briq.

Additional bibliography: Mold., *Phytologia* 40: 71. 1978; Mold., *Phytol. Mem.* 2: 149, 178, 189, & 563. 1980.

LIPPIA TEGULIFERA var. *PEDUNCULATA* Briq.

Additional bibliography: Mold., *Phytologia* 40: 71. 1978; Mold., *Phytol. Mem.* 2: 178 & 563. 1980.

LIPPIA TEPICANA Mold.

Additional bibliography: Mold., *Phytologia* 40: 71. 1978; Mold.,

Phytol. Mem. 2: 65 & 563. 1980.

LIPPIA THYMOIDES Mart. & Schau.

Additional bibliography: Mold., *Phytologia* 40: 71--72. 1978; Mold., *Phytol. Mem.* 2: 149, 421, 422, & 563. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

Recent collectors refer to this plant as a very common spindly shrub, 1.5--2 m. tall, the branches straight, divaricate, brittle, growing on granite cliffs and in open secondary vegetation with small trees and shrubs, at 700--900 m. altitude, flowering in March. The corollas are described as "white with a yellow eye" on Mori & al. 11075 and "white with a yellow throat" on Harley 20194.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 20194 (Ld, N); Mori, Mattos Silva, Kalunki, & Santos 9956 (Ld, N); Mori, Santos, & Thompson 11075 (Ld, N); Pinheiro 1412 (Ld); T. S. Santos 2508 (Ld).

LIPPIA THYMOIDES var. *MUCRONULATA* Mold.

Additional bibliography: Mold., *Phytologia* 40: 72. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

LIPPIA THYMOIDES var. *TONSILIS* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 40: 72. 1978; Mold., *Phytol. Mem.* 2: 149, 421, & 563. 1980; Mold. & Bromley in Harley & Mayo, *Toward Checklist Fl. Bahia* 191. 1980.

Recent collectors describe this plant as a shrub, 3 m. tall, with spreading stems and aromatic leaves, pale-green above, paler beneath, and have encountered it on floodplains with riverine and chiefly herbaceous weedy vegetation, at 980 m. altitude, flowering in March. The corollas are said to have been "lilac with yellow throat" on Harley 19838.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19838 (Ld, N).

LIPPIA TORRESII Standl.

Additional bibliography: Mold., *Phytologia* 40: 72--73 & 82. 1978; Mukherjee & Chanda, *Trans. Bose Res. Inst.* 41: 40. 1978; Mold., *Phytol. Mem.* 2: 65, 81, 84, 357, & 563. 1980.

The *Calzada 2170*, cited below, has previously been regarded as representing *L. umbellata* Cav. or *L. pringlei* Briq., but seems better placed here.

Additional & emended citations: MEXICO: Veracruz: *Calzada 2170* (N). COSTA RICA: Heredia: *Hartshorn 1074* (N), *1085* (Ld).

LIPPIA TRACHYPHYLLA Briq.

Additional bibliography: Mold., *Phytologia* 40: 74. 1978; Mold., *Phytol. Mem.* 2: 175, 178, 189, & 563. 1980

LIPPIA TRISTIS Briq.

Additional bibliography: Mold., *Phytologia* 40: 74 & 78. 1978; Mold., *Phytol. Mem.* 2: 178 & 563. 1980.

LIPPIA TRISTIS var. *ABERRANS* Briq.

Additional bibliography: Mold., *Phytologia* 40: 74. 1978; Mold., *Phytol. Mem.* 2: 178 & 563. 1980.

LIPPIA TROLLII Mold.

Additional bibliography: Mold., *Phytologia* 40: 74. 1978; Mold., *Phytol. Mem.* 2: 175, 189, & 563. 1980.

LIPPIA TROLLI var. *INERMIS* Mold.

Additional bibliography: Mold., *Phytologia* 40: 74. 1978; Mold., *Phytol. Mem.* 2: 175 & 563. 1980.

LIPPIA TURBINATA Griseb.

Additional & emended bibliography: Griseb., *Pl. Lorentz.* 195. 1874; Reiche & Phil. in Reiche, *Estud. Crit. Fl. Chile* 5: 298 & 301--302. 1910; Sanzin, *Anal. Soc. Cient. Argent.* 88: 97, 98, 100, 102, & 134, fig. 4. 1919; Fester & al., *Anal. Asoc. Quím. Argent.* 40: 38--42 (1952) and 42: 43--53. 1955; Mold., *Phytologia* 41: 151. 1979; Troncoso in Burkart, *Fl. Ilustr. Entre Rios* 5: 230 & 272--273. 1979; Mold., *Phytol. Mem.* 2: 134, 183, 189, 357, & 563. 1980.

Emended illustrations: Sanzin, *Anal. Soc. Cient. Argent.* 88: 102, fig. 4. 1919.

Sanzin (1919) affirms that this species is characteristic of the subandean zone, 900--1500 m. altitude, in Argentina. Reiche & Philippi (1910) comment that "En los cordilleras de las provincias de Atacama; en territorio chileno?" Troncoso (1979) says "Muy difundida en la región fitogeográfica del Monte. De dudoso indigenato en Entre Ríos", Argentina. She lists the vernacular names, "poleo" and "té del país", and cites only *Serié* & *Migata s.n.* She notes that the species is "Medicinal; a la infusión de las hojas se le atribuyen propiedades diuréticas; estomacales, etc., muy difundida en la medicina popular. Rica en esencias colátiles".

The Krapovickas & Cristóbal 14659, distributed as the typical form of this species, actually represents *f. angustifolia* Osten.

LIPPIA TURBINATA f. *ANGUSTIFOLIA* Osten

Additional bibliography: Mold., *Phytologia* 40: 76--77. 1978; Mold., *Phytol. Mem.* 2: 183, 189, & 563. 1980.

Recent collectors describe this plant as a shrub, 1.5 m. tall, and have found it in flower and fruit in January. The corollas are said to have been white on the collection cited below.

Additional citations: ARGENTINA: Cordoba: Krapovickas & Cristóbal 14659 (Ws).

LIPPIA TURBINATA f. *MAGNIFOLIA* Mold.

Additional bibliography: Mold., *Phytologia* 40: 76 & 77. 1989; Mold., *Phytol. Mem.* 2: 189, 357, & 563. 1980.

LIPPIA TURNERIFOLIA Cham.

Additional bibliography: Mold., *Phytologia* 40: 78--79. 1978; Mold., *Phytol. Mem.* 2: 149, 175, 178, 180, 189, & 563. 1980; Mold., *Phytologia* 48: 165. 1981.

Recent collectors have found this plant on campo and rocky campo, describing it as xylopodiferous, flowering in September and October. The corollas are said to have been "yellow" on the two collections cited below.

The *Krapovickas, Cristóbal, & Schinini 26496*, distributed as *L. turnerifolia*, actually is the very similar *L. asperima* Cham.

Additional citations: BRAZIL: Paran : *Dziewa 47* (Eu--37817); *Hatschbach 15042* (Eu--1891).

LIPPIA TURNERIFOLIA var. *ANGUSTA* Kuntze

Additional bibliography: Mold., *Phytologia* 40: 79. 1978; Mold., *Phytol. Mem.* 2: 178 & 563. 1980.

LIPPIA TURNERIFOLIA var. *SESSILIFOLIA* Mold.

Additional bibliography: Mold., *Phytologia* 40: 79. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

LIPPIA UKAMBENSIS Vatke

Additional bibliography: Mold., *Phytologia* 40: 79--80. 1978; Holm, Pancho, Herberger, & Plucknett, *Geogr. Atlas World Weeds* 218. 1979; Mold., *Phytol. Mem.* 2: 227, 231, & 563. 1980.

LIPPIA UMBELLATA Cav.

Additional bibliography: Mold., *Phytologia* 41: 151. 1979; Mold., *Phytol. Mem.* 2: 65 & 563. 1980.

Recent collectors describe this plant as a shrub or tree, 3--4 m. tall, with "latex en la flor", scarce or very scarce in oak woods on hillsides, at 2500--2600 m. altitude, in flower in November. Others refer to it as "quite woody and aromatic", the inflorescences clustered at the ends of the branches, the calyxes in the axils of large bracts, and have found it growing in weathered limestone soil on the shaded east-facing sides of steep roadcuts adjacent to rocky streambeds, at only 1080 m. altitude, in fruit in November. The "flowers" are said to have been "green" on *Ventura A. 2501* and the corollas "yellow" on *Ventura A. 2370*.

Additional citations: MEXICO: Distrito Federal: *Ventura A. 2370* (N), *2501* (Me--275783). Durango: *Peterson & Broome 454* (F). M xico: *J. Rzedowski 28722* (Ws).

LIPPIA VELUTINA Schau.

Additional bibliography: Mold., *Phytologia* 40: 82. 1978; Mold., *Phytol. Mem.* 2: 149 & 563. 1980.

Strang has found this plant in anthesis in July, but erroneously distributed as "*Labiatae*".

Additional citations: BRAZIL: Minas Gerais: *Strang 1108* [Castellanos 26691; Herb. Brad. 50068] (Eu--3;228).

LIPPIA VERNONIOIDES Cham.

Additional bibliography: Hocking, *Excerpt. Bot. A.* 25: 378. 1975; Mold., *Phytologia* 40: 83--85 & 201 (1978) and 47: 88. 1980; Mold., *Phytol. Mem.* 2: 149, 175, 420, & 563. 1980.

LIPPIA VERNONIOIDES var. *ATTENUATA* (Mart.) Mold.

Additional bibliography: D. Dietr., Syn. Pl. 3: 600. 1843; Hocking, Excerpt. Bot. A.25: 378. 1975; Mold., Phytologia 40: 201. 1978; Mold., Phytol. Mem. 2: 149, 175, 357, 372, 419, 420, & 563. 1980.

Recent collectors refer to this plant as a very fragrant, medicinal subshrub, 1 m. tall, and have encountered it in cerrado, at 550 m. altitude, flowering in April, May, and July, fruiting in July. They record the vernacular name, "toronjil". The corollas are said to have been "white" on Krapovickas & Schinini 31967.

The Jensen specimen, cited below, is placed here tentatively as it consists mostly of almost pulverized leaves, with only one reasonably good intact leaf; it comprises a crude drug sample from the collections of S. B. Penick & Company, Jersey City, New Jersey, given to me by Dr. George M. Hocking for identification, who states that it was listed formally as "*LIPPIA* LEAVES, *L. hastata* (Salvia Sija)" and obtained originally from Jensen in Seattle, Washington, in or about 1945.

Additional citations: BRAZIL: Goiás: C. Pereira 492 (Ld). BOLIVIA: Santa Cruz: Krapovickas & Schinini 31967 (Ld), 32146 (Ld). CULTIVATED: Washington: Jensen s.n. [Seattle, ca. 1945] (Z).

LIPPIA VERNONIOIDES f. *SUBTRUNCATA* Mold., Phytologia 47: 88. 1980.

Bibliography: Mold., Phytologia 47: 88. 1980; Mold., Phytol. Mem. 2: 157 & 563. 1980.

Citations: BRAZIL: São Paulo: Leitão Filho & al. 7372 (W--2883728--type, Z--photo of type).

LIPPIA VILLAFLORIDANA Kuntze

Additional bibliography: Mold., Phytologia 40: 201--202. 1978; Hocking, Excerpt. Bot. A.33: 88. 1979; Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 272, 275, & 276, fig. 130 a--l. 1979; Mold., Phytol. Mem. 2: 149, 178, 180, 189, & 563. 1980.

Illustrations: Troncoso in Burkart, Fl. Ilustr. Entre Rios 5: 276, fig. 130 a--l. 1979.

Troncoso (1979) regards *L. asperrima* var. *longepedunculata* Mold. as a synonym of *L. villafloridana*. She says that the species "Habita en campos secos y lugares abiertos", citing Burkart 26034 & 26355, Galli 251, Guaglianone & Ragonese s.n., Hauman s.n., Job 43, Meyer 11086, Nicora 5941, and Pedersen 6256. She asserts that the species has definitely diclinous flowers

LIPPIA VINOSA Mold.

Additional bibliography: Mold., Phytologia 40: 202. 1978; Mold., Phytol. Mem. 2: 149 & 563. 1980.

LIPPIA VOLKII Mold.

Additional bibliography: Mold., Phytologia 40: 202. 1978; Mold., Phytol. Mem. 2: 243 & 563. 1980.

LIPPIA WHYTEI Mold.

Additional bibliography: Mold., Phytologia 40: 202. 1978; Mold., Phytol. Mem. 2: 220, 224, 227, 231, 236, 238, 239, 241, & 563.

1980; Mold., *Phytologia* 48: 176. 1981.

Dahlstrand encountered this plant along roadsides, at 1800 m. altitude, in flower and fruit in March.

Additional citations: ZIMBABWE: *Dahlstrand* 58 (Go).

LIPPIA WILMSII H. H. W. Pearson

Additional bibliography: Good & Exell, *Journ. Bot.* 68: Suppl. 2: 140. 1930; Mold., *Phytologia* 40: 202--204. 1978; Mold., *Phytol. Mem.* 2: 223, 227, 236, 238, 239, 241, 243, 246, & 563. 1980.

LIPPIA WILMSII var. *SCABERRIMA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 40: 204. 1978; Mold., *Phytol. Mem.* 2: 238, 239, 246, & 563. 1980.

LIPPIA WILMSII var. *VILLOSA* (Mold.) Mold.

Additional bibliography: Mold., *Phytologia* 40: 204. 1978; Mold., *Phytol. Mem.* 2: 220, 223, 224, 227, 231, 234, 236, 238, & 563. 1980.

LIPPIA WOODII Mold.

Additional bibliography: Mold., *Phytologia* 40: 204. 1978; Mold., *Phytol. Mem.* 2: 238, 239, 246, & 563. 1980.

LIPPIA YUCATANA Loes.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 39 (2): 320. 1913; Fedde & Schust., *Justs Bot. Jahresber.* 40 (2): 335. 1915; Mold., *Phytologia* 40: 204--205. 1978; Hocking, *Excerpt. Bot. A.33*: 88. 1979; Mold., *Phytol. Mem.* 2: 65 & 563. 1980.

ADDITIONAL NOTES ON THE GENUS *CITHAREXYLUM*. XVIII

Harold N. Moldenke

CITHAREXYLUM B. Juss.

Additional & emended bibliography: Sandmark in L., *Amoen. Acad.* 5: 380. 1759; Loud., *Hort. Brit.*, ed. 1, 248 & 529 (1830) and ed. 2, 248 & 529. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 248 & 529. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Ulrich, *Internat. Wörterb.*, ed. 1, 56 (1871) and ed. 2, 56. 1875; Stahl, *Estud. Fl. Puerto Rico*, ed. 1, 3: 293. 1888; D. H. Scott in Solered., *Syst. Anat. Dicot.* [transl. Boodle & Fritsch] 2: 1021 & 1022. 1908; Urb., *Symb. Antil.* 4: 535. 1911; Firminger, *Man. Gard. India*, ed. 6, 2: 386. 1918; Stahl, *Estud. Fl. Puerto Rico*, ed. 2, 3: 293. 1937; Klein, *Sellowia* 31: 163. 1979; Olmsted, Loope, & Hilsenbeck, *So. Fla. Res. Cent. Rep. T.604*: 34 & 48. 1980; Wiggins, *Fl. Baja Calif.* 33, 525, 526, & 529, fig. 496. 1980; Mold., *Phytologia* 47: 359--360 & 504. 1981.

It is of passing interest to note that Reichenbach (1826) classified this genus (as also all the rest of the *Verbenaceae*) in the *Labiatae* [=Lamiaceae].

The *Garcia-Barriga & Jaramillo M. 19906*, distributed as *Citharexylum* sp. in some herbaria, actually is *Aegiphila bogotensis* (Spreng.) Mold.

CITHAREXYLUM BERLANDIERI B. L. Robinson

Additional bibliography: Mold., *Phytologia* 47: 224. 1980; Mold., *Phytol. Mem.* 2: 48, 60, 347, 381, & 530. 1980.

Flores regards this as an "endangered species", but probably only as regarding its occurrence in the United States.

Additional citations: TEXAS: Cameron Co.: *Flores 70* (Ne--93465). MEXICO: Nuevo León: *Hinton 17934* (Au).

CITHAREXYLUM BRACHYANTHUM (A. Gray) A. Gray

Additional bibliography: Mold., *Phytologia* 47: 224. 1980; Mold., *Phytol. Mem.* 2: 48, 60, 375, 381, & 530. 1980.

Recent collectors describe this as a "regular" shrub, 1--1.5 m. tall, and have found it growing in sandy soil in matorral of *Larrea* and *Yucca* and in matorral mediano subinermis parvifolius, at 1000 m. altitude.

Additional citations: MEXICO: Zacatecas: *González Gutierrez 73* (Me--276673); *Medrano & al. 7986* (Me--275990); *Medrano, Zavaleta, Ortiz, & Castellanos 7966* (Me--275460).

CITHAREXYLUM CAUDATUM L.

Additional & emended bibliography: Sandmark in L., *Amoen. Acad.* 5: 380. 1759; Loud., *Hort. Brit.*, ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 248. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Urb., *Symb. Antil.* 4: 535. 1911; Mold., *Phytologia* 47: 359. 1981.

The corollas are said to have been "white" and the fruit orange on *Duke & Idrobo 11562*.

The *Liogier, Liogier, & Martoreli 29890*, distributed as *C. caudatum*, seems better placed as *C. Xperkinsi* Mold., while *Hartley 13322* tends toward *C. caudatum* f. *parvifolium* Mold.

Additional citations: PUERTO RICO: *Hartley 13322* (W--2892409). COLOMBIA: Chocó: *Duke & Idrobo 11562* (N). CULTIVATED: Hawaiian Islands: *Herbst 619* (Ne--149144).

CITHAREXYLUM COOPERI Standl.

Additional bibliography: Mold., *Phytologia* 47: 359. 1981.

Breedlove encountered this plant in montane rainforests with scattered *Pinus* and *Liquidambar*, at 1250 m. altitude, in fruit in October. His collection has been misidentified and distributed in some herbaria as *C. crassifolium* Greenm.

Additional citations: MEXICO: Chiapas: *Breedlove 38060* (Me--269888).

CITHAREXYLUM COSTARICENSE Mold.

Additional bibliography: Mold., *Phytologia* 47: 359. 1981.

Recent collectors describe this plant as a tree, 20 feet tall, the flowers sweetly fragrant, and have found it growing at 4450--5800 feet altitude, in anthesis in February. The corollas are said to have been "white" on the collection cited below.

Additional citations: COSTA RICA: San Jose: Almeda & Nakai 3739 (N).

CITHAREXYLUM CRASSIFOLIUM Greenm.

Additional bibliography: Mold., Phytologia 47: 359--360. 1981.

The *Breedlove 38060*, distributed as *C. crassifolium*, actually seems to represent *C. cooperi* Standl. instead.

CITHAREXYLUM DENTATUM D. Don

Additional bibliography: Mold., Phytologia 47: 360. 1981.

Ellenberg refers to this plant as an "evergreen mountainbush" and encountered it at 3810 m. altitude.

Additional citations: PERU: Ayacucho: Ellenberg 4958a (Ld).

CITHAREXYLUM DONNELL-SMITHII Greenm.

Additional bibliography: Mold., Phytologia 47: 360. 1981.

Sauer describes this plant as a tree, to 6 m. tall, and found it growing in a living *Erythrina* fence around cafetal, at 1200 m. altitude, in fruit in April.

The *Dwyer & Coomes 12928*, distributed as *C. donnell-smithii*, actually is *C. hexangulare* Greenm.

Additional citations: COSTA RICA: San José: Sauer 5798 (Ws)

CITHAREXYLUM EKMANI Mold.

Additional & emended bibliography: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 299 & 301. 1957; Mold., Phytologia 31: 353. 1975; Mold., Phytol. Mem. 2: 88 & 531. 1980.

CITHAREXYLUM ELLIPTICUM Sessé & Moc.

Additional & emended bibliography: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 298 & 299. 1957; Mold., Phytologia 41: 64, 66, & 114. 1978; Mold., Phytol. Mem. 2: 60, 70, 88, 347, & 531. 1980.

Recent collectors describe this species as a scarce shrub or tree, 2--3 m. tall, the corollas white, with an agreeable odor, and have encountered it in matorral and with *Coccoloba uvifera* on 10-meters-high sand dunes, at sealevel to 50 m. altitude, in anthesis in June, July, and October. The Breckons found it "a-long weedy roadsides on consolidated coastal dunes with dominant scattered shrubs varying in form and height with exposure but up to 3 m. tall, the flowers creamy-white, the majority of the plants sterile". The corollas are said to have been "white" also on *Magaña & Cowan 2113*.

Material of *C. ellipticum* has been misidentified and distributed in some herbaria as *C. hexangulare* Greenm. On the other hand, the *Boege 2991*, distributed as *C. ellipticum*, actually is *C. hexangulare* Greenm.

Additional citations: MEXICO: Tabasco: *Magaña & Cowan 2113* (N). Veracruz: *Breckon & Breckon 2017* (Ld); *Fay, Byrne, & Hernandez 810* (N, W--2878391); *Ventura A. 9119* (N).

CITHAREXYLUM ENDLICHII Mold.

Additional bibliography: Mold., Phytologia 31: 353. 1975; Mold., Phytol. Mem. 2: 60 & 531. 1980.

CITHAREXYLUM DOLIGNITICUM Berry

Additional bibliography: Mold., *Phytologia* 31: 353. 1975; Mold., *Phytol. Mem.* 2: 368 & 531. 1980.

CITHAREXYLUM FLABELLIFOLIUM S. Wats.

Additional bibliography: Mold., *Phytologia* 41: 64. 1978; Mold., *Phytol. Mem.* 2: 60, 70, & 531. 1980; Wiggins, *Fl. Baja Calif.* [527] & 529, fig. 496. 1980.

Illustrations: Wiggins, *Fl. Baja Calif.* [527], fig. 496. 1980.

Webster & Lynch describe this plant as a fairly common shrub, 1--2 m. tall, with gray, smooth bark, and "violet flowers". They have encountered it on silty flats at the base of lava boulders, at 100 m. altitude.

The Kishler 674, distributed as *C. flabellifolium*, actually is *C. racemosum* Sessé & Moc.

Additional citations: MEXICO: Sonora: Webster & Lynch 17012 (Me--268060). MOUNTED ILLUSTRATIONS: Wiggins, *Fl. Baja Calif.* fig. 496 (Z, Z).

CITHAREXYLUM FLEXUOSUM (Ruiz & Pav.) D. Don

Additional synonymy: *Citharexylon spinosum* Bonpl. ex Spreng. in L., *Syst. Veg.*, ed. 16, 2: 764. 1825.

Additional & emended bibliography: Spreng. in L., *Syst. Veg.*, ed. 16, 2: 764. 1825; D. Dietr., *Syn. Pl.* 3: 615. 1843; Fedde & Schust., *Justs Bot. Jahresber.* 40 (2): 334. 1915; Mold., *Phytologia* 41: 64--65. 1978; Mold., *Phytol. Mem.* 2: 132, 347, 381, 382, & 531. 1980.

CITHAREXYLUM FLEXUOSUM var. *GLABERRIMUM* Mold.

Additional bibliography: Mold., *Phytologia* 31: 355. 1975; Mold., *Phytol. Mem.* 2: 132 & 531. 1980.

CITHAREXYLUM FORSITHIAEFOLIUM Massalonge

Additional bibliography: Mold., *Phytologia* 31: 355--356. 1975; Mold., *Phytol. Mem.* 2: 368 & 531. 1980.

CITHAREXYLUM FRUTICOSUM L.

Additional & emended synonymy: *Citharexylum fruticosum* var. *fruticosum* [L.] apud Alain in Leon & Alain, *Fl. Cuba*, imp. 1, 4: 299. 1957. *Citharexylum fruticosum* var. *fruticosum* [Alain] apud Mold., *Phytologia* 6: 355, in syn. 1958. *Cytherexylum fruticosum* L. ex Mold., *Phytol. Mem.* 2: 396, in syn. 1980.

Additional bibliography: Sandmark in L., *Amoen. Acad.* 5: 380. 1759; D. Dietr., *Syn. Pl.* 3: 615. 1843; Urb., *Symb. Antill.* 4: 535. 1911; Firminger, *Man. Gard. India*, ed. 6, 2: 386. 1918; H. N. & A. L. Mold., *Pl. Life* 2: 51, 52, & 84. 1948; Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 299--300, fig. 129. 1957; Boquiren, *Mycologia* 63: 954. 1971; Pierre-Noel, *Nom. Polyglot. Pl. Hait.* 470. 1971; D. Powell, *Bull. Inst. Jam. Sci.* 15 (2): 419 & 422. 1973; Napp-Zinn, *Anat. Blatt. A* (1): 383. 1974; L. H. & E. Z. Bailey, *Hortus Thrid* 275. 1976; Little, *U. S. Dept. Agr. For. Serv. Conserv. Res. Rep.* 20: 19. 1976; Woodbury & Little, *U. S. Dept. Agr. For. Serv. Res. Paper ITF-19*: 9 & 23. 1976.

[to be continued]

ISOETES MELANOPODA IN SABINE PARISH, LOUISIANA

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On May 2, 1980 a collection of Isoetes melanopoda Gay and Dur. was made from Sabine Parish, Louisiana. This is the first collection from the state since those reported by Brooks and Maples from Calcasieu Parish in 1971. It also represents the northernmost collection from Louisiana. Although Thieret (1980) indicated that Isoetes melanopoda is known from four parishes---Calcasieu, Rapides, Avoyelles, and East Baton Rouge---the last three represent old collections and several attempts over the past ten years by the junior author and others have failed to locate any living populations of the plants in these parishes.

The Sabine Parish collection was made by the senior author while collecting for a survey of the vascular plants of the parish for his M.S. thesis project at Northeast Louisiana University. One plant, Carroll 1344, was collected mixed with other plants from a low area near Bayou San Patricio north of Noble. A visit to the site by the authors on June 7, 1980 established the presence of a large population of Isoetes melanopoda (Thomas 71436 and Carroll 1443).

The site is flat and flooded during the spring but is dry during the summer and fall. The Isoetes grows in a low area with clay soil but only 30-40 feet away on sandy soil no plants occur although the elevation is only six inches higher. Pinus taeda, Vaccinium arboreum, and Quercus stellata var. stellata occur on the sandy elevated areas but are absent from the low areas where Ulmus crassifolia, Crataegus viridis, and Quercus stellata var. mississippiensis occur.

Brown and Correll (1942) described the soils on which Isoetes melanopoda grows as moist prairie soils. They said that: "The species is especially abundant around the marais ponds in these soils. Most of these...soils consist of a top layer 6-9 inches, occasionally as much as 18 inches thick, over an impervious layer 4-8 inches thick, which in turn is

usually underlain by a less compact soil containing calcareous concretions." A soil sample taken by the senior author from the Sabine Parish site and analyzed by the Northeast Louisiana University Soil Analysis Lab shows that the soil at this site is high in percentage of calcium as noted in the following table.

TABLE I
CALCIUM CONTENT OF ISOETES SOIL SAMPLE

Depth	Ph	Parts Ca per million	Percentage saturation of Ca
0-6"	6.7	820	43.2
18-24"	9.0	1527	37.9
30-36"	8.8	11132	31.4

This location was inundated with about 5-7 inches of water when the first collection was made in May, 1980. By June of 1980 no standing water was peresent but the soil was still moist. In August, 1980 the senior author visited the area and the soil was very dry and no evidence of Isoetes could be found. When the senior author visited the site in March, 1981 to take a soil sample, it was again inundated and the Isoetes was again abundant (Carroll 2499).

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- Thieret, J. W. 1980. *Louisiana Ferns and Fern Allies*. Lafayette Natural History Museum, Lafayette, La. 124 pp.

ADDITIONAL COLLECTIONS OF BOTRYCHIUM LUNARIOIDES FROM
TEXAS AND OKLAHOMA AND COMMENTS ON ITS DORMANCY

by

R. Dale Thomas, Tim Briley, and Neil Carroll,
Department of Biology, Northeast Louisiana University,
Monroe, 71209.

Only one plant of Botrychium lunarioides (Michx.) Sw. has been reported from Texas (Thomas 1979). This plant was collected by Thomas from San Augustine County in 1972. On a recent collecting trip to southeast Oklahoma, April 10, 1981, the authors collected several plants of Botrychium lunarioides from Douglassville Cemetery in Cass County in northeast Texas. The cemetery had already been mown so the fertile parts of the fronds of the plants are missing (Thomas #75189, Briley #2325, and Carroll).

Botrychium lunarioides has been reported from one site in Choctaw County, Oklahoma and one in McCurtain County (Thomas 1978b). On April 6, 1980 Briley found a large population of several hundred plants in a grazed pasture west of Idabel in McCurtain County (Briley #1252). Until this population was discovered only a total of five plants had been seen in Oklahoma. A trip was made to the site by the authors on April 11, 1981 to study the population. Although the area was searched extensively, only about fifteen plants were seen (Thomas #75341, Briley #2477, and Carroll). One other collection was made from McCurtain County by the authors on April 10, 1981 (Thomas #75224, Briley #2360, and Carroll).

The senior author has collected Botrychium lunarioides from Georgia, Alabama, Florida, Louisiana, Texas, Oklahoma, and Arkansas. Although this species is one of the hardest of plants to see in the field because of the way its prostrate frond blends in with Trifolium, Oxalis, and other plants, this fern appears to remain dormant during dry springs. The summer, fall, and winter of 1980 was very dry and this was followed by an unusually dry spring in 1981.

Thomas has visited many sites where he has previously observed large populations of Ophioglossum crotalophoroides, O. petiolatum, and O. nudicaule var. tenerum in Louisiana during the spring of 1981 and has noted a drastic reduction of the number of plants with leaves above ground during this dry spring.

Two patterns of dormancy seem to be illustrated by Ophioglossum petiolatum, O. nudicaule var. tenerum, O. crotalophoroides, and Botrychium lunarioides. O. petiolatum and O. nudicaule var. tenerum will break dormancy during any season of the year after at least a lengthy wet period. Although these two species are more common in the spring than in other seasons, both can be collected in Louisiana during any month. One large population of O. nudicaule var. tenerum in Ouachita Parish has been observed as dormant during each of the twelve months as well as having fertile fronds each month depending on moisture. O. petiolatum seems to follow the same pattern. O. crotalophoroides and Botrychium lunarioides break dormancy only during the spring. Population density differences observed in the field by Thomas would indicate that during dry springs many plants of these two perennial species remain dormant. Although O. nudicaule var. tenerum and O. petiolatum were both recollected in Oklahoma by the authors on April 10, 1981 (Thomas #75222, Briley #2358, and Carroll and Thomas #75227, Briley #2363, and Carroll, respectively), reduced numbers of Ophioglossum was observed there also.

The paucity of Botrychium lunarioides plants observed at the large McCurtain County location mentioned above would support the conclusion about this species remaining dormant in dry springs. This grape fern is also rare in Arkansas (Thomas 1978a). The authors visited the site of the Sevier County, Arkansas collection on April 12, 1981. Although the largest population known from the state occurs here, no plants were found and Ophioglossum crotalophoroides was also not seen. Thomas and John McCoy, another of his graduate students, visited the Union County location for B. lunarioides and O. petiolatum on April 24, 1981. Only one plant was seen (Thomas #75641 and McCoy #852) and O. petiolatum and O. crotalophoroides showed greatly reduced populations there also.

Based on twelve years of field experience throughout the range of these four species, but especially on experience in Louisiana, Arkansas, and Texas, by Thomas, it is concluded that Botrychium lunarioides and Ophioglossum crotalophoroides will remain dormant during unusually dry springs. O. petiolatum and O. nudicaule var. tenerum will remain dormant during the same conditions but will break dormancy later in the year if sufficient moisture occurs. Since all three of these species of Ophioglossum are southern in distribution, at the northern limits of their range the last two species probably function in a similar manner of O. crotalophoroides and Botrychium lunarioides and break dormancy only during springs with sufficient moisture. The habitats of O. crotalophoroides and B. lunarioides are usually sandier and drier than those of the other two species and therefore their habitat dries out faster than that of O. petiolatum and O. nudicaule var. tenerum. All four species are perennial and the above ground portion (fertile and sterile segments of fronds) is short lived. O. nudicaule var. tenerum and O. petiolatum forms extensive populations by vegetative propagation (this can especially be observed in sand near Battleship Alabama in Mobile Bay, Mobile County, Alabama). No vegetative propagation has been observed in either O. crotalophoroides or B. lunarioides.

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BOOK REVIEWS

Alma L. Moldenke

"DALEAE IMAGINES - An Illustrated Revision of *ERRAZURIZIA*

Philippi, *PSOROTHAMNUS* Rydberg, *MARINA* Liebmman, and *DALEA* Lucanus emend. Barneby, including all species of *LEGUMINOSAE* tribe *AMORPHEAE* Borissova ever referred to *DALEA*" by Rupert C. Barneby, viii & 891 pp., 142 b/w multfig. plates & 1 diag. Memoirs of the New York Botanical Garden, Vol. 27, Bronx Park, New York 10458. 1977. \$50.00 paper-bound.

What a superbly and exquisitely prepared study this is! The adverbs in the preceding sentence are not usually appropriate for most of the world's well prepared monographs, but they are very truly germane here. There is such careful word choice and neat use of language (natural, not forced) throughout the discussions, descriptions, keys, etc. There is accuracy and artistic skill shown in the many plates that the author drew for each species and variety. There are helpful diagrams showing logical relationships and suggested evolutionary sequences. Barneby expresses his concept of the genus *Dalea* in the equation: "*Dalea* = (*Parosela* sensu Rydb. — *Marina* sensu Barneby) + *Thornbera* Rydb. + (*Petalostemon* Michx. *Kuhnistera* Lamk.)". It embraces "all *Amorpheae* furnished with epistemonous petals combined with two collateral ovules and a basic chromosome complement of seven or (rarely) eight" for its 161 species and pertinent additional sub-specific units that fit well into five subgeneric groups. Besides bibliography and index there is an appendix for each of the following with their sources: I. Species Incertae Sedis Ignotaeque, II. Nomina Nuda, III. Species Exclusae and IV. Vouchers for Chromosome Counts.

"YELLOW-POPLAR (*Liriodendron tulipifera* L.) An Annotated Bibliography to and Including 1974" compiled by Roland E. Schoenike, ca. 500 unnumbered pp. & 1 b/w U.S.A. distribution map. Department of Forestry, Clemson University, Clemson, South Carolina 29631. 1980. Paper-bound.

"This volume's combined knowledge should prove indispensable to foresters, scientists, students, and future writers who need references to literature already available". Following the Oxford Classification System as used in Forestry Abstracts it cites, arranges alphabetically, and annotates 5,891 "items of literature on all aspects of American and Chinese species of yellow-poplar, their description, botany, ecology of the forests in which they appear, wood technology, silviculture, protection, and utilization.....in foreign countries where they are exotics, their planting for amenity purposes, and their use in recreation."

"AN ENUMERATION OF CHINESE MATERIA MEDICA" by Shiu-ying Hu, xxiv & 287 pp., distributed for the Chinese University Press, Hong Kong, by the University of Washington, Seattle, Washington 98105. 1981. \$21.50.

In his FOREWORD to this valuable study Richard Evans Schultes states that the author "is not only a taxonomic botanist who has given years to the study of the Chinese flora but an economic botanist who has to her credit many publications on food and medicinal plants of China. For the growing interest in ethnopharmacological circles in Chinese medicine, it is fortunate that a scientist of her capacities has undertaken the task."

Part I lists across the pages for 2270 entries (often with subdivisions) transliterated Chinese name, name in character, scientific name, English name(s), pharmaceutical name with plant or animal part used. Part II lists in systematic arrangement about 1,700 species of plants, 135 species of animals and 110 kinds of minerals and other chemicals used in Chinese medicine along with their corresponding numbers from Part I. Appendices list syllabification of Wade romanization system, a conversion table of Pinyin to Wade, lists of families and genera, conversion of simplified modern Chinese characters into classical form, and an index of Chinese names in character with their text numbers. Through Chinese and/or English a tremendous amount of scientific information is here made easily available.

"A. ENGLER & K. PRANTL'S DIE NATURLICHEN PFLANZENFAMILIEN," Second Edition, Volume 28b 1 *Angiospermae: Gentiales: LOGANIACEAE*, edited by A. J. M. Leeuwenberg, viii & 255 pp., 132 b/w photo, 78 fig. & 14 tab. Duncker & Humblot Verlagsbuchhandlung, Postfach 41 03 29, 1000 Berlin 41, West Germany. 1980. Lw. DM.188.

The format, concepts and arrangements differ considerably from the original edition because they are founded upon different fields of research as reported by the authors, including the editor. Herein "the family comprises 29 genera, arranged in 10 tribes, and approximately 470 species". There is first an orienting discussion of relationships between taxa inside and taxa outside the family. This is followed by chapters written by various specialists in taxonomy, vegetative architecture, wood anatomy, pollen morphology, embryology, cytology, phytochemistry, and uses. The line drawn and photographic illustrations document effectively many of the taxonomic conclusions presented. This study may well be the beginning of the classic of today, as the original edition was for yesterday.

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NOMENCLATURAL TRANSFERS AND
TAXONOMIC NOTES ON SOME SOUTH AMERICAN GENTIANACEAE¹

James S. Pringle

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A number of new combinations are needed in order that several South American specimens of Gentianella, and one of Gentiana, sent to me for identification can be labeled with validly published names. Generic status for Gentianella is widely accepted by contemporary students of the Gentianaceae. Combinations for many of the South American species have been published, e.g., by Fabris (1960), who discussed the generic placement of the South American gentians in his monograph on Gentianella in Ecuador. However, he did not live to complete the work on the Peruvian species in which some of the combinations made here would have appeared.

During the course of these studies, some problems of typification and identification, discussed here, were disclosed, and in other cases new collections have helped to resolve long-standing taxonomic problems. Also, four chromosome counts, each the first for the respective species, are reported in this paper.

Gentiana casapaltensis (J. Ball) Pringle, status nov. Basionym:
Gentiana sedifolia var. casapaltensis J. Ball, J. Linn.
Soc., Bot. 22:49. 1885.

Gentianella carneorubra (Gilg) Fabris ex Pringle, comb. nov.
Basionym: Gentiana carneorubra Gilg, Bot. Jahrb. Syst.
54(Beibl. 118):55. 1916, "carneo-rubra."

Gentianella cerastioides (H.B.K.) Fabris. n=18. ECUADOR: Cotopaxi:
al lado de la Carretera Pan Americana entre Quito y Latacunga,
frente a la NASA, Escobar & Amundsen 612, 17 Sept 1978 (HAM).²

Gentianella cosmantha (Griseb.) Pringle, comb. nov. Basionym:
Gentiana cosmantha Griseb., Abh. Königl. Ges. Wiss.
Göttingen 19:209. 1874.

Gentianella ernestii (Briq.) Fabris ex Pringle, comb. nov. Basionym:
Gentiana ernestii Briq., Candollea 4:326. 1931.

Gentianella formosissima (D. Don ex G. Don) Fabris ex Pringle, comb.
nov. Basionym: Eudoxia formosissima D. Don ex G. Don, Gen.
Hist. 4:202. 1837 ("1838"). Gentiana formosissima (D. Don ex G.
Don) Gilg, Bot. Jahrb. Syst. 54(Beibl. 118):54. 1916.

Although Eudoxia formosissima was described as having "scarlet" corollas, its identity as the distinctive and spectacular species represented, e.g., by Macbride 4348 (F) and Duncan et al. 2635 (HAM, MO, UC) has been recognized by Gilg (1916), Macbride (1959), and Fabris (in adnot., Macbride 4348). On specimens seen by Macbride (1959), the fresh corollas had been described as "dark rose, purple, red, and ... dull magenta" (Gentiana formosissima) or "lilac (blue-lilac-reddish)" (G. regina). Those of Duncan et al. 2635 (HAM, MO) were described as "lavender." These descriptions indicate that corolla color in this species varies in depth and in position along a blue-violet to red-violet continuum. A similar range of corolla colors prevails in Gentianella cerastioides (H.B.K.) Fabris, but a few specimens have been collected with orange-red corollas, e.g., Holm-Nielsen et al. 6582 (AAU, S). Similar variation may exist in G. formosissima. Alternatively, Don's description of the corollas as scarlet may represent an assumption based on the color of the dried corollas, or an interpretation of an ambiguous term in the collection data.

I have followed Gilg (1916) and Macbride (1959) in including Gentiana herrediana Raimondi ex Wedd. within this species. I have also accepted Macbride's informal suggestion that Gentiana regina Gilg, by which name this species has perhaps been better known, should also be included in G. formosissima. Gilg (1916) differentiates these "species" according to the presence of trichomes at the base of the stamens in G. regina, and their absence in G. formosissima. According to Macbride (1959), however, the corolla of G. formosissima is "sparsely barbate" within, and that of G. regina has "many" trichomes. The presence or number of such trichomes is easily obscured in Gentianella unless the corolla is thoroughly spread out so as to disclose the interior, and variability in the number of trichomes has been noted in other species (see Macbride, 1959, on G. liniflora). The types of both G. herrediana and G. regina were collected in the Department de Ancash (the type locality of G. formosissima is recorded only as "Peru").

Gentianella incurva (Hook.) Fabris.

Plants of this species have sometimes been identified as Gentiana primulifolia Griseb. or Gentianella primulifolia (Griseb.) Holub. In Gilg's (1916) key, G. primulifolia is distinguished from G. incurva by its being "low," with the flowering stems "1-flowered, rarely 2-3 flowered," whereas G. incurva is reached via "Plants mostly tall, stems many flowered ..." In another couplet, however, G. incurva is said to have "short few-flowered cymes," and elsewhere plants of the species are described as "low" (from material called "largely a translation" by Macbride, 1959). Gilg (1916) considered the small corolla of G. primulifolia, up to 1.5 cm long, in proportion to the calyx, 11-12 mm long, to be distinctive. Macbride (1959) however, noted that in the type specimen of G. primulifolia (Mathews 853, G, photo F!), "The flowers are obviously not fully grown."

Plants closely corresponding to the type of G. incurva occur in abundance at and near the height-of-land between Huancayo and Pariahuanca in the Departamento de Junín, Perú (Pringle 2503, HAM, MO). There is some variation in plant size and in corolla color, but plants there with red, red-and-yellow, orange-and-yellow, and occasionally all-yellow corollas are obviously conspecific. The same species is common in much of Junín; I have seen it in the vicinity of Tarma and La Oroya, not far from Cerro de Pasco, the type locality of G. incurva. The type locality of G. primulifolia is the same area between Huancayo and Pariahuanca where G. incurva grows so abundantly, and I found no other species with corollas in the red to yellow color range there. The type of G. primulifolia, although a poor specimen, is compatible with G. incurva. The name G. primulifolia, therefore, seems best regarded as a synonym of G. incurva.

Gentianella pavonii (Griseb.) Fabris. n = 18. PERU: Junín: just above the higher of 2 ponds S of highway between Tarma and La Oroya at Abras Cochass, Pringle 2521, 10 Jan 1979 (HAM).

There have been problems in applying the name Gentianella pavonii, with epithet priority from 1845, to recent collections. The basionym, Gentiana pavonii Griseb., was published in direct substitution for Selatium multicaule D. Don ex G. Don, the epithet multicaulis having been applied to another species in Gentiana (and subsequently in Gentianella). Selatium multicaule is typified by a Ruiz & Pavón collection from Tarma, Perú. The Ruiz & Pavón collections seen by the Don brothers were those then in the herbarium of A.B. Lambert, the source (via several intermediaries) of the Ruiz & Pavón collections now in G (Miller, 1970). Therefore, the replicate of the type collection in G (photo in F!), identified as such by Ernst Gilg, can be accepted as the holotype. Isotypes, probably not seen by the Dons, are in F and MA. This collection and my no. 2521 are clearly conspecific, although the Ruiz & Pavón collection comprises smaller, more slender plants with longer peduncles. Grant 7536 (F, 2 sheets) and Macbride 3027 (F) are highly similar to my no. 2521 in floral morphology and corolla color, and include some small, slender-stemmed plants closely resembling those in the type collection, thus bridging any discontinuity between my collection and the type. One of the most distinctive features uniting these specimens is the squarrose calyx lobes. Also, in the original description of Selatium multicaule (Don, 1837), the corolla lobes were described as being "connivent." This feature, in which the corollas remain loosely closed at anthesis, further supports the identity of the plants I observed at Abras Cochass with the type of G. pavonii. The corollas of the type were described as being pale lilac, the ground color of the corollas in all of the recent collections cited here.

Grant 7536 and Macbride 3027 were, however, identified as "Gentianella aff. paludicola" by Fabris. A photograph (F) of the type specimen of Gentiana paludicola Gilg, Weberbauer 2694 (formerly in B, not extant), shows a much more erect, less leafy plant apparently of a different species. This specimen, moreover, was collected in the Departamento de Ancash, whereas Grant 7536, Macbride 3027, Pringle 2521, and the type of G. pavonii were all collected in mountains between Lima and Tarma. my collection

being from the same pass where Ruiz and Pavón had collected en route to Tarma. If G. pavonii and G. paludicola were considered conspecific, the epithet pavonii would have priority.

Weberbauer 6599 was identified as Gentianella pavonii by Fabris and earlier as Gentiana multicaulis (G. Don) Gilg (illegitimate name; not G. multicauls Gillies ex Griseb.) by Gilg. This specimen, however, exhibits neither decumbent stem bases nor squarrose calyx lobes, and its corolla lobes appear to have been spreading, probably white or yellow without purple suffusion. Thus this specimen seems less similar to Ruiz & Pavón's type collection than those cited above.

Supplementing the very brief descriptions of the corollas of G. pavonii published to date, it is noted here that they are 13-15 mm long, with the lobes about twice as long as the tube, and that they are pale violet with dark violet veins. Although this species has been said to have the "corolla tube glabrous" (Macbride, 1959), there is some minute pubescence within the corolla tube, immediately below and in line with the sinuses between the lobes. There are, however, no conspicuous longer trichomes.

Although Gentianella is a large and diverse genus, counts to date indicate little variation in basic chromosome numbers, with $x = 9$ ($n = 9, 18, 27$) in all species counted except G. auriculata (Pall.) J.M. Gillett ($n = 24$) (Comastoma Toyokuni and Gentianopsis Ma excluded). Although counts have been published for only a few of the many South American species, thus far all have been found to have $n = 18$.

Gentianella rapunculoides (Willd. ex Schultes) Pringle, comb. nov.

Basionym: Gentiana rapunculoides Willd. ex Schultes in Roemer & Schultes, Syst. Veg. 6:185. 1820. Gentiana diffusa H.B.K., Nov. Gen. Sp. Pl. 3:134 (quarto text). 1819 ("1818"), non Vahl, Symb. Bot. 3:47. 1794. Gentianella diffusa (H.B.K.) Fabris, Bol. Soc. Argent. Bot. 8:179. 1960 $n = 18$. ECUADOR: Azuay: 17 km oeste Cuenca en carretera que conduce a Sayause, Escobar 660, 30 Oct 1978 (HAM).

A new nomenclatural combination is required for this species because of the illegitimacy of the name Gentiana diffusa H.B.K.

Gentianella sanctorum (Gilg) Pringle, comb. nov. Basionym:

Gentiana sanctorum Gilg, Repert. Spec. Nov. Regni Veg. 2:41. 1906.

Within G. sanctorum I include those plants treated by Macbride (1959) as Gentiana verticillata Wedd. 1861, non L. 1758. These "species" were distinguished by size difference, especially in the corollas. Macbride's doubts that they were in fact distinct have been supported by the present study; Mostacero L. et al. 555 (HAM, HUT, MO) is intermediate in most measurements.

Halenia weddelliana Gilg. n = 11. ECUADOR: Cotopaxi: Pan American Highway south of Quito, across the highway from the NASA station, Escobar & Amundsen 613, 17 Sept 1978 & 19 Jan 1979 (HAM).

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¹Contribution No. 45 from the Royal Botanical Gardens, Hamilton, Ontario, Canada.

²Abbreviations for herbaria follow Holmgren & Keuken (1974).

A YELLOW-FLOWERED FORM OF ERYTHRINA POEPPIGIANA

Julian A. Steyermark and Tobias Lasser
Herbario Nacional
Caracas, Venezuela

ERYTHRINA POEPPIGIANA (Walp.) O.F. Cook,
forma REDMONDII Steyermark & Lasser, forma nova

A forma poeppigiana floribus luteis recedit.

VENEZUELA: Estado Miranda: Los Chorros, Avenida principal, Caracas, en frente de la Escuela Hebraica, alt. 900 m., 9 March 1981, Parker Redmond s.n. (holotype, VEN).

Paratype: VENEZUELA: Estado Mérida: Mérida, flores amarillas, individuo escaso entre los comunes de flores rojas, Marzo, 1964, L. Aristeguieta 5270 (VEN).

Erythrina poeppigiana flowers during the months of the dry season, producing showy masses of bright red or orange-red blossoms which precede the appearance of the foliage. Occasional trees occur as a color form with the flowers completely yellow, here recorded from two widely separated stations in Venezuela.

The authors take pleasure in naming this variation for Mr. Parker Redmond of Caracas, who collected the type material.

PRODOMUS BRYOLOGIAE ANDINAE I,
THE POLYTRICHUM JUNIPERINUM GROUP IN BOLIVIA--REVIVAL OF
POLYTRICHUM ARISTIFLORUM MITT.*

Marko Lewis

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Abstract. Polytrichum aristiflorum Mitt., usually considered a synonym of Polytrichum juniperinum Hedw., is regarded as an accepted species. Differences between the two taxa are discussed.

This is the first in an ongoing series of short papers which will discuss studies of "problem" groups occurring in the Central Andean region of South America, as well as other facets of Andean bryology. These preliminary contributions will be in anticipation of a Handbook of Bolivian Mosses.

Polytrichum juniperinum Hedw. and related species of Polytrichum may be easily recognized in the field by the widely involute margins of the leaf blade; the strongly involute portion of the leaf is made up of transversely elongate cells. Messmer and Frye (1947) reduced all known names of this group in North and South America to synonyms of P. juniperinum except for P. trachynotum C. Muell., a species found in Tierra del Fuego and Mexico. In 1979, I collected 31 specimens of this group from altitudes ranging from 1400 m. to 5000 m. in Bolivia. Based upon studies of these collections I believe the name Polytrichum aristiflorum Mitt. refers to a recognizable species and should be revived.

Mitten (1869) separated P. aristiflorum from other members of the group by referring all plants with elongate-oblong leaf bases to this species. While there is a strong tendency for P. aristiflorum to produce this sort of leaf blade, as opposed to the wider obovate or oblong leaf blade in P. juniperinum, there are other clearer ways to separate the species.

P. aristiflorum is confined to lower and middle altitudes, growing from 1400 m. to 3250 m. at the upper limit of Bolivian forests. It produces stems of 10 to over 20 cm. in length. When dry, the leaves are yellowish-green, laxly arranged, somewhat crisped and spreading when dry. When moistened they are

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squarrose from an erect, tightly appressed base, and the bright yellow leaf bases are clearly visible. The leaf blades are narrowly subulate with a conspicuous yellow costal region and produce long, thin aristae which are very pronounced in the upper leaves. The plants are usually fertile with the fruit ripening towards the end of the rainy season, i.e., in February and March.

P. juniperinum, on the other hand, is confined to high altitude areas. Collections were made at altitudes ranging from 4100 m. to 5000 m. These plants show the same habit as I am accustomed to see in Alaska. The stems are at most 3-5 cm. in height. When dry, leaves are brown to brown-orange, tightly appressed to the stem and not at all crisped. When moistened they are ca. 30°-60° spreading from a less appressed base. The leaf bases are orange and not visible. The leaf blades are shorter and wider, the yellow costal region is rarely conspicuous and aristae, when present, are short and thick. Though rarely in fruit, two collections were made at 4400 m. with fruit not yet ripe on 5 June. Projecting ahead, we may assume that these would be ripe towards the end of the dry season.

In both species, tomentum is produced from the shoulders of the leaf base. In P. aristiflorum the upper leaves appear to have cilia arising from this area. Further down the stem the leaf blades are worn away, but the leaf bases remain and are covered with white tomentum. P. juniperinum seldom reaches the length necessary to produce this phenomenon or at least to any marked extent.

At middle altitudes 4 intermediates were collected. These plants tended to be closer to P. aristiflorum, but when dry the leaves were appressed to the stem. A specimen from this group was collected at 3920 m. with fruit ripe on 27 February. Another, from 4140 m., had fruit ripe on 4 April. It is possible, perhaps probable, that the two species are capable of interbreeding in the center of their altitudinal zonation.

No collections of the P. juniperinum group other than these two species were found.

Polytrichum antillarum Rich., nom. illeg., seems to be identical to P. aristiflorum.

Literature Cited

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- Mitten, W. 1869. Musci austro-american. Journ. Linn. Soc. London, Bot. 12: 619-622.



FIGURES 1-6 (left) Polytrichum aristiflorum Mitt.-- 1. Habit of wet plant.-- 2. Habit of dry plant.-- 3. Cells of leaf shoulder which produce tomentum (from point a in fig. 4).-- 4. Leaf.-- 5. Arista.-- 6. Lamella.

FIGURES 7-13 (right) Polytrichum juniperinum Hedw.-- 7. Habit of dry plant.-- 8&9. Habit of wet plants.-- 10. Lamella.-- 11. Leaf.-- 12. Arista.-- 13. Cells of leaf shoulder (from point b in fig. 11).-----Figures of Polytrichum aristiflorum from Lewis 79-1751, Depto. La Paz, Bolivia, ca. 1400 M.

Figures of Polytrichum juniperinum Hedw. from Lewis 79-1905, Depto. La Paz, Bolivia, ca. 4800 M. Note: In this illustration P. juniperinum shows decolorate cells along margin of leaf shoulder (f. 13) and lamella 7-8 cells high (f. 10). These characters are at present not known to be constant and need further study.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXLVI

Harold N. Moldenke

AMASONIA HIRTA var. *PARAËNSIS* Mold., var. nov.

Haec varietas a forma typica speciei pilis ubique brevioribus recedit.

This variety differs from the typical form of the species in having the pubescence on stems, inflorescences, and foliage much shorter and not at all hirsute.

The type of the variety was collected by T. Plowman, G. Davidse, N. A. Rosa, C. S. Rosário, and M. R. dos Santos (no. 9525) along roadsides near kilometer marker 1532 six km. north of Lição do Pará, on the Belém to Brasília highway Br.010, in Município Paragominas, at approximately 4°5' S., 47°32' W., Pará, Brazil, on March 3, 1980, deposited in my personal herbarium. The collectors describe the plant as 75 cm. tall, the leaves purple beneath, the bracts red, and the corolla yellow.

LANTANA CUJABENSIS var. *PARAËNSIS* Mold., var. nov.

Haec varietas a forma typica speciei recedit capitulis parvis rotundato-capitatis et pedunculis gracillimis, plerumque per nodos 4 plerumque 1.5--3 cm. longis.

This variety differs from the typical form of the species in having smaller more rounded-capitate heads, the peduncles very slender, often 4 per node, only 1.5--3 cm. long.

The type of the variety was collected by T. Plowman, N. A. Rosa, and C. S. Rosário (no. 9686) in dense roadside thickets 3 km. north of Breu Branco, 40 km. south of Reprêsa Ticuruf, in Município Tucuruí, along highway BR.422, at approximately 3°55' S., 49°44' W., at 90 m. altitude, Pará, Brazil, on March 17, 1980, and is deposited in my personal herbarium. The collectors describe the plant as a prickly subshrub, 2.5 m. tall, the corollas white with a yellow spot in the throat, turning rose-pink with age.

LIPPIA ROTUNDIFOLIA var. *BAHIENSIS* Mold., var. nov.

Haec varietas a forma typica recedit laminis foliorum majoribus ca. 6 cm. longis 5 cm. latis bracteis brevioribus 5 mm. longis apicaliter acutis non attenuatis.

This variety differs from the typical form of the species in its generally plainly petiolate and larger leaves, the blades to about 6 cm. long and 5 cm. wide, rounded in outline, the petioles stout, to 7 mm. long, and the involucre bracts shorter, about 5 mm. long, basally 4 mm. wide, apically merely acute and not at all attenuate.

The type of this variety was collected by Scott Mori (no. 12919) in campo rupestre at Pai Inacio, at km. 232 on highway BR.242, about 15 km, northeast of Palmeiras, in Município de Palmeiras, at 1000--1200 m. altitude, Bahia, Brazil, on October

31, 1979, and is deposited in my personal herbarium. The collector notes that the plant is a shrub, 1 m. tall.

SYNGONANTHUS DENSIFLORUS var. *LONGIFOLIUS* Mold., var. nov.

Haec varietas a forma typica speciei foliis caulinis ca. 3 valde elongatis usque ad 33 cm. longis basaliter equitantibus recedit.

This variety differs from the typical form of the species in being more slender, with about 3 greatly elongated stem-leaves which are basally equitant and to 33 cm. in length, for overtopping the apical whorl of 4 cm. long involucreal leaves.

This variety is based on *Plowman, Davidse, Rosa, Rosário, & Reis dos Santos* 9090 from 2 km. west of Conceição do Araguaia, along highway PA.287, at about 8°15' S., 49°18' W., at 300 m. altitude, in Município Conceição do Araguaia, Pará, Brazil, collected on February 24, 1980, and deposited in my personal herbarium. The collectors describe the plant as a rosulate herb, with light-brown inflorescences, some of which were proliferous, growing in a marsh with shrubs.

SYNGONANTHUS DENSIFOLIUS var. *VENEZUELENSIS* Mold., var. nov.

Haec varietas a forma typica speciei foliis basalibus glabris foliis involucreantibus vaginisque pedunculatisque parce tenuiterque villosulis, pedunculis numerosis, recedit.

This variety differs from the typical form of the species in having its basal leaves glabrous, while its involucreal leaves, sheaths, and peduncles are sparsely villosulous with rather long, very weak, whitish hairs, with about ten peduncles per plant.

The variety is based on *Huber & Tillet* 2918 from "pequeña sabanita distante unos 15 min al SE del sitio 'Chipital' ubicada en la ribera izquierda (Sur) del Caño Yagua, a unos 15 km. (en línea recta) río arriba desde la boca", approximately at 3° 29' N., 66°41' W., at about 120 m. altitude, in the department of Atabapo, Amazonas, Venezuela, collected on December 6, 1978, and deposited in my personal herbarium. The collectors describe the obviously immature plants as herbs, to 30 cm. tall, and rather frequent in occurrence.

VITEX RUFESCENS var. *PARAËNSIS* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum asymmetricis majoribus utrinque densissime villosis recedit.

This variety differs from the typical form of the species in its 3 leaflets being much larger, to 18 cm. long and 11 cm. wide, completely sessile, more or less asymmetric, irregularly obovate or broadly elliptic, both surfaces very densely hirsute, the petioles very stout, about 9 cm. long, very densely hirsute.

This variety is based on *H. T. Silva & C. Rosário* 4983 from sandy soil in dry campo at Joanes, Marajó island, Pará, Brazil, collected on January 28, 1979, and deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as a tree, 7 m. tall, the trunk 10 cm. in diameter, the calyx ferruginous, and the corollas rose-color; wood samples were collected.

ADDITIONAL NOTES ON THE GENUS *CITHAREXYLUM*. XIX

Harold N. Moldenke

CITHAREXYLUM FRUTICOSUM L.

Additional bibliography: Batson, Gen. East. Pl. 147. 1977; Fournet, Fl. Ilust. Phan. Guad. Mart. 1404 & 1405, fig. 668. 1978; Little, Atlas Trees U. S. 5 [U. S. Dept. Agr. For. Serv. Misc. Publ. 1361]: 12, map 182. 1978; Mold., Phytologia 41: 65--68, 72, & 118. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 52. 1978; Lewalle & Lakhmiri, Arb. Ornament. Maroc. 1: [13]. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Avery & Loope, S. Fla. Res. Cent. Rep. T-574: 33. 1980; Byrne, Atoll Res. Bull. 240: 199. 1980; Mold., Phytologia 46: 27. 1980; Olmsted, Loope, & Hilsenbeck, So. Fla. Res. Cent. Rep. T-604: 34 & 48. 1980; Mold., Phytol. Mem. 2: 21, 85--88, 92--94, 96--101, 103, 114, 121, 124, 125, 347, 380--383, 396, & 531. 1980; Mold., Phytologia 48: 273. 1981.

Additional & emended illustrations: Alain in León & Alain, Fl. Cuba, imp. 1, 4: 300, fig. 129. 1957; Batson, Gen. East. Pl. 147. 1977; Fournet, Fl. Ilust. Phan. Guad. Mart. 1405, fig. 668. 1978.

Recent collectors describe this plant as a dense shrub or small bushy-crowned slender tree, 2.5--8 m. tall, the trunk 15 cm. in diameter, the outer bark light gray-brown with shallow longitudinal fissures, rather stringy, the inner bark straw-color, the branches and twigs grayish, the leaves "thickish", the flowers very fragrant, the calyx green, and the fruit "large", hard, turning red. They have encountered the species along open roadsides, especially brushy ones, and on dry scrubby coastal hills, at 50 m. altitude, in fruit in November and in both flower and fruit in September. Hartley reports that the flowers are much visited by bees.

Little (1978), calling this species the "Florida fiddlewood", gives its distribution in Florida and beyond as follows: "Local in s. Fla. incl. Fla. keys, n. on e. coast to Cape Canaveral. From Bahamas through West Indies incl. P. R. and V. I. Also Venezuela to Surinam." Woodbury & Little (1976) record it from Buck Island in the Virgin Islands.

The corollas on Correll 49939 and Hartley 13364 are said to have been "white". Morton emphasizes, as many other collectors have done, that the petioles when fresh are orange in color. The Baileys (1976) assert that the species blooms "throughout the year" and produces a useful timber. Haines (1922) reports it cultivated in Bihar & Orissa, India. Proctor records the local name, "bastard mahogany", in Anguilla island. The plant described and illustrated by Lewalle & Lakhmiri (1979) as *C. fruticosum* from Morocco seems definitely to be the usually cultivated *C. spinosum* L. instead.

Fournet (1978) regards *C. cinereum* L., *C. villosum* Jacq., *C.*

subserratum Sw., *C. pentandrum* Vent., *C. bahamense* Millsp., and *C. fruticosum villosum* O. E. Schulz as straight synonyms of typical *C. fruticosum* L., but in my opinion the subspecific taxa in this very variable species are worth maintaining.

Additional recently reported vernacular names for the species include "bálsamo", "bois carré", "bois de fer blanc", "café cimarrón", "canilla de venado", "fiddlewood", "long-tom", "palo de guitarra", "penda", "pendola", "pendula", "spicate fiddlewood", and "susanaleche". Boquiren (1971) records this species as host to the fungus, *Epithele vermifera* (Bourd.) Boquiren.

The Roberts LBB.16315, distributed as *C. fruticosum*, actually is *C. macrophyllum* Poir., while Proctor 1851 is *C. spinosum* L.

Additional citations: FLORIDA: Big Pine Key: Brumbach 9477 (N). BAHAMA ISLANDS: Great Inagua: D. S. Correll 49939 (N). CAYMAN ISLANDS: Grand Cayman: Correll & Correll 51000 (N). PUERTO RICO: Hartley 13364 (W--2892408), 13369 (W--2892415). PUERTO RICAN ISLANDS: Vieques: Griffis & Brox N-29-15 (N). LEEWARD ISLANDS: Anguilla: Proctor 18624 (W--2833481). WINDWARD ISLANDS: St. Vincent: C. V. Morton 4726 (W--1883890).

CITHAREXYLUM FRUTICOSUM f. *BAHAMENSE* (Millsp.) Mold.

Additional bibliography: Mold., *Phytologia* 41: 66--67. 1978; Mold., *Phytol. Mem.* 2: 86, 99, 347, & 531. 1980.

CITHAREXYLUM FRUTICOSUM var. *BRITTONII* Mold.

Additional bibliography: Fedde & Schust., *Justs Bot. Jahresber.* 40 (2): 334. 1915; Mold., *Phytologia* 41: 67 & 68. 1978; Lopez-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Mold., *Phytol. Mem.* 2: 102, 114, 347, 381, & 531. 1980.

CITHAREXYLUM FRUTICOSUM var. *SMALLII* Mold.

Additional & emended bibliography: Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 300. 1957; Mold., *Phytologia* 41: 67. 1978; Mold., *Phytol. Mem.* 2: 86--88, 97--99, & 531. 1980.

CITHAREXYLUM FRUTICOSUM f. *SUBSERRATUM* (Sw.) Mold.

Additional & emended bibliography: Loud., *Hort. Brit.*, ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 248. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; D. Dietr., *Syn. Pl.* 3: 614. 1843; Woodr., *Gard. Trop.*, ed. 6, imp. 8, 436. 1910; Firninger, *Man. Gard. India*, ed. 6, 2: 386. 1918; Haines, *Bot. Bihar Orissa*, ed. 1, 4: 708. 1922; Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 300. 1957; Haines, *Bot. Bihar Orissa*, ed. 2, 2: 743. 1961; Mold., *Phytologia* 41: 67--68. 1978; Mold., *Phytol. Mem.* 2: 88, 94, 347, 380--383, & 531. 1980.

CITHAREXYLUM FRUTICOSUM f. *SUBVILLOSUM* (Mold.) Mold.

Additional & emended bibliography: Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 300. 1957; Mold., *Phytologia* 41: 66--68. 1978; Mold., *Phytol. Mem.* 2: 21, 86--88, 93, 94, 97--100, 103, 125, 347, 380, 382, & 531. 1980.

CITHAREXYLUM FRUTICOSUM var. *VILLOSUM* (Jacq.) O. E. Schulz

Additional & emended bibliography: Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; D. Dietr., Syn. Pl. 3: 614. 1843; Urb., Symb. Antil. 4: 535. 1911; H. N. & A. L. Mold., Pl. Life 2: 52. 1948; Alain in Leñn & Alain, Fl. Cuba, imp. 1, 4: 300. 1957; Mold., Phytologia 41: 66 & 68. 1978; Mold., Phytol. Mem. 2: 21, 86, 88, 93, 94, 97--101, 347, 381, 383, & 531. 1980.

CITHAREXYLUM FULGIDUM Mold.

Additional bibliography: Mold., Phytologia 31: 453. 1975; Mold., Phytol. Mem. 2: 60 & 531. 1980.

Recent collectors have encountered this species as secondary in mangrove forests of *Avicennia* and some *Pachira* and *Enallagma*, flowering in June, fruiting in February.

Additional citations: MEXICO: Chiapas: *Miranda* 6376 (Me--72291), 9162 (Me--68183). Veracruz: *Gómez-Pompa & Riba* 57 (Me--118580).

CITHAREXYLUM GENTRYI Mold.

Synonymy: *Citharexylum gentry* Mold. ex López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18, sphalm. 1979.

Additional bibliography: Mold., Phytologia 41: 69 & 112. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 127, 382, & 531. 1980.

Dodson describes this species as a tall slender tree, to 20 m. high, and found it growing in mature forests, at 150--220 m. altitude, fruiting in May. Material has been misidentified and distributed in some herbaria as *C. poeppigii* Walp. and as *Rubiaceae*.

Additional citations: ECUADOR: Los Ríos: *Dodson* 6002 (W--2843899).

CITHAREXYLUM GLABRUM (S. Wats.) Greenm.

Additional bibliography: Mold., Phytologia 41: 69. 1978; Mold., Phytol. Mem. 2: 60 & 531. 1980.

CITHAREXYLUM GLAZIOVII Mold.

Additional bibliography: Mold., Phytologia 41: 69. 1978; Mold., Phytol. Mem. 2: 140, 347, & 531. 1980.

CITHAREXYLUM GLEASONIANUM Mold.

Additional bibliography: Mold., Phytologia 41: 69 & 105. 1978; Mold., Phytol. Mem. 2: 60, 347, & 531. 1980.

Recent collectors have found this species growing at 1500 m., altitude, flowering in May and June.

Additional citations: MEXICO: Puebla: *Gold* 166 (Me--156517); *Miranda* 8858 (Me--73929).

CITHAREXYLUM HERRERAEE Mansf.

Additional bibliography: Mold., Phytologia 41: 69. 1978; Mold.,

Phytol. Mem. 2: 132 & 531. 1980.

CITHAREXYLUM HEXANGULARE Greenm.

Additional & emended bibliography: Metcalfe & Chalk, Anat. 2: 1033. 1950; Mold., Phytologia 41: 62, 63, 69--70, 114, & 122. 1978; Hocking, Excerpt. Bot. A.33: 88. 1979; Mold., Phytol. Mem. 2: 60, 71, 74, 75, 78, 80, 347, & 531. 1980; Mold., Phytologia 48: 272. 1981.

Recent collectors describe this plant as a scarce shrub or tree, 2--8 m. tall, the trunk 10 inches in diameter, and have found it growing on riverbanks and in association with *Solanum* and *Leonurus*, at sealevel, in fruit in November and December.

Material of *C. hexangulare* has been misidentified and distributed in some herbaria as *C. ellipticum* Sessé & Moc. On the other hand, the *Magaña & Cowan 2113*, distributed as *C. hexangulare*, actually is *C. ellipticum* Sessé & Moc.

Additional citations: MEXICO: Chiapas: *C. L. Lundell 17845* (Me--137842). Tabasco: *C. Cowan 1612* (N). Veracruz: *Boege 2991* (N, N); *Dorantes 3611* (N). BELIZE: *Dwyer & Coomes 12928* (Ws).

CITHAREXYLUM HEXANGULARE var. *BREVIFOLIUM* Mold.

Additional bibliography: Mold., Phytologia 41: 70. 1978; Hocking, Excerpt. Bot. A.33: 88. 1979; Mold., Phytol. Mem. 2: 60 & 531. 1980.

CITHAREXYLUM HEXANGULARE var. *LATIFOLIUM* Mold.

Additional bibliography: Mold., Phytologia 41: 70 & 122. 1978; Hocking, Excerpt. Bot. A.33: 88. 1979; Mold., Phytol. Mem. 2: 60, 80, & 531. 1980.

Recent collectors have found this plant in fruit (in addition to the months previously recorded) in November.

Additional citations: MEXICO: Chiapas: *Breedlove 20250* (Ld); *Breedlove & Smith 21661* (N); *Breedlove & Thorne 30775* (Au).

CITHAREXYLUM HIDALGENSE Mold.

Additional bibliography: Mold., Phytologia 41: 70--71. 1978; Mold., Phytol. Mem. 2: 60, 347, 382, & 531. 1980.

Recent collectors describe this species as a rare shrub, 3--5 m. tall, with very fragrant flowers and shiny red or "green and red" fruit, and have found it growing in deep sandy soil in matorral on hillsides, in woods and secondary woods of *Pinus* and *Quercus*, and in pinewoods in cañada, at 1800--2170 m. altitude, flowering in March and April, fruiting in July and September. It is said to be scarce in Puebla and Veracruz, but abundant in Hidalgo. The corollas are described as having been "white" on *Moreno G. 79*, "whitish" on *Ventura A. 817*, and "rosy-white" on *Hernandez & Cedillo Trigos 1151*.

The *Ventura A. 1015* and *12752*, distributed as *C. hidalgense*, actually are *C. affine* D. Don (or possibly *C. mexicanum* Mold.).

Additional citations: MEXICO: Hidalgo: *Gimate L. 1060* (N). Nuevo León: *Hernández & Cedillo Trigos 1151* (Me--219598, Me). Pu-

ebla: *Miranda* 3654 (Me--93087, Me--93088); *Moreno G.* 79 (N).
Veracruz: *Fay & Calzada* 892 (Au, H, W--2879279); *Ventura A.* 817 (N).

CITHAREXYLUM HINTONI Mold.

Additional bibliography: Mold., *Phytologia* 41: 71. 1978; Mold., *Phytol. Mem.* 2: 60, 382, & 531. 1980.

CITHAREXYLUM HIRTELLUM Standl.

Additional bibliography: Mold., *Phytologia* 41: 62, 70, & 71. 1978; Mold., *Phytol. Mem.* 2: 60, 71, 74, 83, & 531. 1980.

Recent collectors describe this plant as a tree, 15 m. tall, and have encountered it in evergreen forests, fruiting in February.

Additional citations: MEXICO: Veracruz: *Sousa* 3409 (Me--113088).

CITHAREXYLUM HIRTELLUM var. *GUATEMALENSE* Mold.

Additional bibliography: Mold., *Phytologia* 31: 456. 1975; Mold.; *Phytol. Mem.* 2: 71, 382, & 531. 1980.

CITHAREXYLUM xHYBRIDUM Mold.

Additional bibliography: Mold., *Phytologia* 41: 66, 76, & 107. 1978; Mold., *Phytol. Mem.* 2: 93, 101, 103, 382, 383, & 531. 1980.

CITHAREXYLUM ILICIFOLIUM H.B.K.

Additional synonymy: *Citharexylon ilicifolium* Bonpl. ex Spreng. in L., *Syst. Veg.*, ed. 16, 2: 764. 1825. *Citharexylon ilicifolium* Humb. & Kunth apud D. Dietr., *Syn. Pl.* 3: 615. 1843. *Citharexylon ilicifolium* Mold. ex López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18, sphalm. 1979.

Additional bibliography: D. Dietr., *Syn. Pl.* 3: 615. 1843; L. H. & E. Z. Bailey, *Hortus Third* 275. 1976; Mold., *Phytologia* 41: 71 (1978) and 43: 316. 1979; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Mold., *Phytol. Mem.* 2: 127, 132, 173, 347, 381, 382, & 531. 1980.

Recent collectors have described this species as a shrub, 2 m. tall, and have encountered it growing "on a stone wall", at 2830--3800 m. altitude, flowering in April and July. The corollas are said to have been "white" on *Boeke & Loyola* 2144, *Cerrate & al.* 4634, and *Norman s.n.*

Additional citations: ECUADOR: Azuay: *Boeke & Loyola* 2144 (N). Pichincha: *Norman s.n.* (W--2848685). PERU: Lima: *Cerrate, Gómez, & Ojeda* 4635 (W--2702888).

CITHAREXYLUM ILTISII Mold.

Additional bibliography: Mold., *Phytologia* 41: 71. 1978; Mold., *Phytol. Mem.* 2: 132 & 531. 1980.

CITHAREXYLUM INTEGERRIMUM (Kuntze) Mold.

Additional bibliography: Mold., *Phytologia* 41: 72 & 115. 1978; Mold., *Phytol. Mem.* 2: 80 & 531. 1980; Mold., *Phytologia* 47: 360. 1981.

Recent collectors describe this plant as a small to medium-sized dioecious tree and have found it growing at 1400 m. altitude, in anthesis in December. The corollas are said to have been "white" on Haber 260.

Material of *C. integerrimum* has been misidentified and distributed in some herbaria as *C. donnell-smithii* Greenm.

Additional citations: COSTA RICA: Puntarenas: Haber 260 (Z).

CITHAREXYLUM xJAMAICENSE Mold.

Additional bibliography: Mold., Phytologia 41: 72. 1978; Mold., Phytol. Mem. 2: 93, 382, & 531. 1980.

CITHAREXYLUM JÖRGENSENII (Lillo) Mold.

Additional bibliography: Mold., Phytologia 41: 72. 1978; Mold., Phytol. Mem. 2: 185 & 531. 1980.

CITHAREXYLUM JURGENSENI Briq.

Additional bibliography: Mold., Phytologia 41: 72. 1978; Mold., Phytol. Mem. 2: 61 & 531. 1980.

CITHAREXYLUM KARSTENI Mold.

Additional & emended bibliography: H. N. & A. L. Mold., Pl. Life 2: 55 & 66. 1948; Mold., Phytologia 41: 62 & 72--73. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 107, 114, 382, & 531. 1980.

Recent collectors speak of the corollas of this plant as being "amarillo-verdosas con el ápice rojizo" and have encountered it at 1600 m. altitude, flowering in June.

Additional citations: COLOMBIA: Cundinamarca: García-Barriga & Jaramillo Mejía 20533 (W--2844259).

CITHAREXYLUM KARSTENI var. *LANCEOLATUM* Mold.

Additional bibliography: Mold., Phytologia 41: 73. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 107, 114, 382, & 531. 1980.

Recent collectors have described this plant as a shrub or small tree, to 4 m. tall, the calyx green, and the fruits orange, and have encountered it in fields near road margins, at 1600 m. altitude, in flower and fruit in March. The corollas are said to have been "pale-yellow" on Barclay & al. 3750.

Additional citations: COLOMBIA: Cundinamarca: Barclay, Juajibío, & Gama 3750 (W--2831831).

CITHAREXYLUM KERBERI Greenm.

Additional bibliography: Mold., Phytologia 31: 461. 1975; Mold., Phytol. Mem. 2: 61, 347, & 531. 1980.

CITHAREXYLUM KOBUSKIANUM Mold.

Additional bibliography: Mold., Phytologia 41: 73. 1978; Mold., Phytol. Mem. 2: 132 & 531. 1980.

CITHAREXYLUM KRUKOVII Mold.

Additional bibliography: Mold., *Phytologia* 31: 461. 1975; Mold., *Phytol. Mem.* 2: 140 & 531. 1980.

CITHAREXYLUM KUNTHIANUM Mold.

Additional synonymy: *Citharexylon kunthianum* Humb. & Kunth apud D. Dietr., *Syn. Pl.* 3: 615. 1843.

Additional bibliography: D. Dietr., *Syn. Pl.* 3: 615. 1843; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 605. 1927; Mold., *Phytologia* 41: 74, 108, & 120. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Mold., *Phytol. Mem.* 2: 107, 347, 381, & 531. 1980.

Knuth (1927) cites Pittier 10769 from Zulía, Venezuela, and records the vernacular name, "totumilla". Recent collectors describe this species as a tree, 5 m. tall, with orange-red drupaceous fruit, and have found it growing at 1000--2000 m. altitude, fruiting in January and February, and list the additional vernacular name, "pendo".

Additional citations: COLOMBIA: Nariño: Fernández & More 1195 (W--2844814). Valle: Cuatrecasas, Patino, & Ramos 27510 (W--2606067).

CITHAREXYLUM LAETUM Hiern

Additional bibliography: Mold., *Phytologia* 41: 74. 1978; Mold., *Phytol. Mem.* 2: 140 & 531. 1980.

Araujo refers to this plant as a solitary tree, 10 m. tall, and found it bearing vermilion fruit in February.

Additional citations: BRAZIL: Rio de Janeiro: Araujo 2259 [Herb. FEEMA 14733] (Z).

CITHAREXYLUM LANKESTERI Mold.

Additional bibliography: Mold., *Phytologia* 41: 74. 1978; Hocking, *Excerpt. Bot. A.33*: 90. 1979; Mold., *Phytol. Mem.* 2: 61, 75, 77, 80, 83, & 531. 1980.

Recent collectors have encountered this plant on a volcano slope and "local" in pasture areas with scattered trees and remnant forest, at 2500 m. altitude, fruiting in March and December. They describe it as a tree, 35 feet tall, 30 inches in diameter at breast height, the immature drupes at first orange in color, purple-black when mature, 2-seeded.

Additional citations: MEXICO: Chiapas: Miranda 5057 (Me--71575). COSTA RICA: Heredia: Almeda, Nakai, & Verity 4316 (N); Hartshorn 1126 (Ld).

CITHAREXYLUM LAURIFOLIUM Hayek

Additional bibliography: Mold., *Phytologia* 41: 105. 1978; Hocking, *Excerpt. Bot. A.33*: 91. 1979; Mold., *Phytol. Mem.* 2: 132, 173, & 532. 1980.

CITHAREXYLUM LEMSII Mold.

Additional bibliography: Mold., *Phytologia* 32: 51. 1975; Mold.,

Phytol. Mem. 2: 80 & 532. 1980.

CITHAREXYLUM xLEONIS Mold.

Additional bibliography: Mold., Phytologia 41: 105. 1978; Mold., Phytol. Mem. 2: 88, 382, 383, & 532. 1980.

CITHAREXYLUM LIGUSTRIIUM Van Houtte

Additional synonymy: *Citharexylon ligustrinum* Dipp. ex C. K. Schneid., Illust. Handb. Laubholz. 2: 590. 1911. *Citharexylum ligustrinum* Van Houtte ex Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 51, sphalm. 1978.

Additional bibliography: C. K. Schneid., Illust. Handb. Laubholz. 2: 590. 1911; Mold., Phytologia 41: 105. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 51. 1978; Mold., Phytologia 47: 224. 1980; Mold., Phytol. Mem. 2: 61, 347, 375, 381--383, & 532. 1980.

Recent collectors describe the fruit (probably immature) of this species as greenish-red, and have found the plant growing in "black rocky argillaceous soil of primary pine-oak" forests, at 1500--2000 m. altitude, in both flower and fruit in August. The corollas are said to have been "white" on Conrad & Conrad 3257.

Material of *C. ligustrinum* has been misidentified and distributed in some herbaria as *C. caudatum* L.

Additional citations: MEXICO: Puebla: Conrad & Conrad 3257 (W--2846396). Veracruz: Ortega 460 (N).

CITHAREXYLUM LOJENSE Mold.

Additional bibliography: Mold., Phytologia 41: 105. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 127 & 532. 1980.

CITHAREXYLUM LUCIDUM Schlecht. & Cham.

Emended synonymy: *Citharexylon lucidum* Cham. apud D. Dietr., Syn. Pl. 3: 614. 1843.

Additional bibliography: D. Dietr., Syn. Pl. 3: 614. 1843; Mold., Phytologia 41: 106. 1978; Mold., Phytol. Mem. 2: 61 & 532. 1980.

Ventura refers to this species as a shrub, 3 m. tall, with yellow fruit, and found it to be "rare" in matorral in cañada, at 1300 m. altitude, in fruit in January.

Additional citations: MEXICO: Veracruz: Ventura A. 9493 (N).

CITHAREXYLUM LYCIOIDES D. Don

Additional bibliography: Mold., Phytologia 41: 106. 1978; Mold., Phytol. Mem. 2: 61 & 532. 1980.

Material of this species has been misidentified and distributed in some herbaria as *Rhamnus capraefolia* Schlecht.

Additional citations: MEXICO: Hidalgo: Herb. Inst. Biol. 4875 (Me).

CITHAREXYLUM MACRADENIUM Greenm.

Additional bibliography: Mold., Phytologia 41: 106. 1978; Mold.,

Phytol. Mem. 2: 80, 83, & 532. 1980; Mold., Phytologia 47: 360. 1981.

Recent collectors describe this plant as a medium to large tree, 7 m. tall, with bright-orange pendulous fruits. They have found it growing in pastures, at 1550 m. altitude, in flower in September and in fruit in March. The corollas are said to have been "white" on *Haber 195*.

The *Lent 2236*, distributed as *C. macradenium*, actually is *C. donnell-smithii* Greenm.

Additional citations: COSTA RICA: Puntarenas: *Burger & Gentry 8800* (Go); *Haber 195* (Ld).

CITHAREXYLUM MACROCHLAMYS Pittier

Emended synonymy: *Citharexylum macroclamys* Pittier ex Mold., Phytologia 41: 106, in syn. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979.

Additional bibliography: Mold., Phytologia 41: 106. 1978; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 40. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 83, 107, 382, & 532. 1980.

Recent collectors describe this species as a tree, 5--15 m. tall, with pendent infructescences and green immature fruit, and have encountered it in wet and disturbed riverside pluvial forests, at 100 m. altitude, in flower in June and in fruit in August. The corollas are described as having been "white" on *Scolnik 1641*. The vernacular name, "nacero", is reported.

Additional citations: PANAMA: Darién: *Duke 13550* (N). COLOMBIA: Chocó: *Gentry & Fallen 17764* (W--2846394); *Scolnik 1641* (N).

CITHAREXYLUM MACROPHYLLUM Poir.

Additional bibliography: Mold., Phytologia 41: 106--107, 111, & 112. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 107, 114, 121, 124, 125, 127, 140, 381, & 532. 1980; Mold., Phytologia 47: 359. 1981.

Recent collectors describe this plant as a tree, 10--22 m. tall, with a curved bole, slightly fluted at the base, the bark rather smooth, grayish-brown, very slightly fissured, the leaves thin-coriaceous, very slightly scabrid, shiny medium-green above, dull pale-green beneath, the calyx pale-green, and the stamens white. They have encountered it in secondary vegetation with remnants of primary forest and in secondary forests, at 320--900 m. altitude, in flower in March and June. *Breteler 5039* is accompanied by a wood sample and the corolla is said to have been "pale-yellow". Steyermark and his associates report "some trees sprouting shoots from fallen logs", describing the leaves as coriaceous and dark-green. They found it in rocky quebradas.

Other collectors describe the tree as 6--24 m. tall, the trunk to 40 cm. in diameter at breast height, the stems and branches hollow with conspicuous ant-holes in the internodes, the flowers fragrant, the calyx green, the filaments white, the anthers "cream-maroon", the style green, the stigma yellow, and

the fruit red, and have found it growing in capoeira and in "mature selectively logged forests", in flower in February, March, and May, in fruit in February and July, known locally as "totumillo blanco". They describe the fruit as orange, borne in pendent infructescences. The corollas are said to have been "white" on Berti 166, Liesner & al. 7908, Prance & al. 11160, Roberts LBB.16315.

Material of *C. macrophyllum* has been misidentified and distributed in some herbaria as *C. fruticosum* L. and *C. poeppigii* Walp. On the other hand, the Haber 247, distributed as *C. macrophyllum*, actually is *C. costaricense* Mold.

Additional citations: VENEZUELA: Aragua: Steyermark, Huber, & Braun 114209 (N). Bolívar: Breteler 5039 (N). Delta Amacuro: Berti 166 (N, N, N, N). Falcón: Liesner, González, & Wingfield 7908 (Ld). SURINAM: Roberts LBB.16415 (N). ECUADOR: Napo: A. Gentry 9810 (Go). BRAZIL: Maranhão: Rosa 2503 (N). Roraima: Prance, Steward, Ramos, & Monteiro 11160 (N, N).

CITHAREXYLUM MATUDAE Mold.

Additional bibliography: Mold., Phytologia 32: 55. 1975; Mold., Phytol. Mem. 2: 61 & 532. 1980.

CITHAREXYLUM MEXICANUM Mold.

Additional bibliography: Mold., Phytologia 32: 55 (1975) and 47: 143. 1980; Mold., Phytol. Mem. 2: 61 & 532. 1980.

Recent collectors describe this plant as 2 m. tall and have encountered it in secondary riparian pine-oak forests on rocky soil, flowering in July. The corollas are said to have been "white" on the collection cited below.

It is possible that the Ventura A. 1015 & 12752, cited under *C. affine*, may, instead, represent *C. mexicanum*, a very closely related taxon.

Additional citations: MEXICO: Veracruz: Fay, Byrne, & Hernández 759 (Au, N, W--2879288).

CITHAREXYLUM MICROPHYLLUM (P. DC.) O. E. Schulz

Additional bibliography: Mold., Phytologia 41: 107. 1978; Mold., Phytol. Mem. 2: 94 & 532. 1980.

CITHAREXYLUM MIRIFOLIUM Mold.

Additional bibliography: Mold., Phytologia 41: 107. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 18. 1979; Mold., Phytol. Mem. 2: 107, 114, & 532. 1980.

CITHAREXYLUM MOCINII D. Don

Emended synonymy: *Citharexylon rugesdasii* Cham. apud D. Dietr., Syn. Pl. 3: 614. 1843.

Additional bibliography: D. Dietr., Syn. Pl. 3: 614. 1843; Glaz., Bull. Soc. Bot. France 58, Mem. 3: 545. 1911; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 319. 1913; Mold., Phytologia 41: 107--108. 1978; Mold., Phytol. Mem. 2: 61, 71, 75, 78, 80, 382, & 532. 1980.

Recent collectors refer to this species as a tree, 10 m. tall, with pendent infructescences and orange colored fruit, and have found it growing in cloudforests and at the edges of lower montane wet forests, in pastures, and in high or middle subevergreen primary forests with yellowish-red rocky soil and associated with *Talauma mexicana*, at 1400--2400 m. altitude, flowering in November, and fruiting in December and March. The corollas are said to have been "white" on Neill 3018.

The *Williams, Molina R., & Williams 24810*, distributed as typical *C. mocinni*, actually represents f. *williamsii* Mold.

Additional citations: MEXICO: Chiapas: *Lathrop 6783* (Me--155646). Veracruz: *Hernandez M. 1363* (N); *Vazquez T. 357* (N). NICARAGUA: Jinotega: *W. D. Stevens 5569* (Ld). Matagalpa: *Neill 3018* (N).

CITHAREXYLUM MOCINNI var. *LONGIBRACTEOLATUM* Mold.

Additional bibliography: Mold., *Phytologia* 32: 58. 1975; Mold., *Phytol. Mem.* 2: 61, 71, 75, 382, & 532. 1980.

CITHAREXYLUM MOCINNI f. *WILLIAMSII* Mold.

Additional bibliography: Mold., *Phytologia* 41: 108. 1978; Mold., *Phytol. Mem.* 2: 78 & 532. 1980.

Additional citations: NICARAGUA: Matagalpa: *Williams, Molina R., & Williams 25810* (Ws).

CITHAREXYLUM MONTANUM Mold.

Additional bibliography: Mold., *Phytologia* 41: 108--109. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Øllgaard & Balslev, *Rep. Bot. Inst. Univ. Aarhus* 4: 130. 1980; Mold., *Phytol. Mem.* 2: 107, 127, 347, 381, & 532. 1980.

The *Balslev & Madsen 10433*, distributed as typical *C. montanum*, seems better regarded as representing var. *chimboraense* Mold.

CITHAREXYLUM MONTANUM var. *CHIMBORAZENSE* Mold.

Additional bibliography: Mold., *Phytologia* 41: 109. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Mold., *Phytol. Mem.* 2: 127 & 532. 1980.

Balslev & Madsen have found this plant in partially cleared montane forests, at 1800--1900 m. altitude, flowering in October, and describe it as a tree, 6--8 m. tall, with "white" corollas. Their material was originally distributed as typical *C. montanum* Mold.

Additional citations: ECUADOR: Napo: *Balslev & Madsen 10433* (Ac, N).

CITHAREXYLUM MONTEVIDENSE (Spreng.) Mold.

Additional bibliography: D. Dietr., *Syn. Pl.* 3: 614. 1843; L. H. & E. Z. Bailey, *Hortus Third* 275. 1976; Mold., *Phytologia* 41: 109. 1978; Troncoso in Burkart, *Fl. Ilustr. Entre Rios* 5: 290--291, fig. 137. 1979; Mold., *Phytol. Mem.* 2: 140, 177, 180, 185, 347, 382, 396, & 532. 1980.

Additional illustrations: Troncoso in Burkart, *Fl. Ilustr.*

Entre Rios 5: 291, fig. 137. 1979.

Recent collectors describe this plant as a tree, 6--7 m. tall, with orange-colored fruit, and have found it growing at the edge of monte, fruiting in April. The Baileys (1976) describe the corollas as "yellow", as they are also said to have been on *Schinini & al.* 11628.

Troncoso (1979) gives the overall distribution of this species as "Sur de Brasil, Paraguay, Uruguay e NE argentino hasta la selva en galería del Delta y ribera platense e isla Martín García", listing the following vernacular names: "aguay-guazu", "blanco grande", "coronillo colorado", "espina de bañado", and "tarumá espinudo". She notes that it is "Cultivado en calles, parques y plazas como ornamental. Su madera blanca y algo blanda se utiliza en carpintería." She cites *Burkart* 8315 & 31058 and *Troncoso & al.* 1269 from Entre Ríos, Argentina, in the San Isidro herbarium.

The *Schinini & Carnevali* 10590, distributed as *C. montevidense*, actually is *C. myrianthum* Cham.

Additional citations: ARGENTINA: Corrientes: *Krapovickas, Cristobal, Tressens, Schinini, & Quarin* 25291 (Ld); *Schinini & al.* 11628 (Ws).

CITHAREXYLUM MUCRONATUM Fourn. & Mold.

Additional bibliography: Mold., *Phytologia* 32: 60--61 (1975) and 47: 224. 1980; Mold., *Phytol. Mem.* 2: 78 & 532. 1980.

Recent collectors describe what appears to be this species as a low shrub, 4--5 m. tall, or a small to moderately large tree, 5--7 m. tall, the calyx green, the inflorescence arching, pendent in fruit, and the fruit itself fleshy, orange-colored. They have encountered it in disturbed roadside thickets, in islands of broadleaf forest on savannas, in pastures and scattered coffee plantations, along rivers,, at forest edges in wet forest second-growth, on open pine savannas, in broadleaf forests along small watercourses, and in coastal scrub behind the beach, at sealevel to 900 m. altitude, in anthesis in April, May, June, and September, and in fruit in June and October. The corollas are described as having been "white" on *Neill* 4541 and *Stevens* 4001, 8173, 8580, & 8599 and "cream-white" on *Neill* 2573.

Additional citations: NICARAGUA: Boaco: *Stevens & Grijalva* 14743 (Ld). Chontales: *W. D. Stevens* 4001 (Ld). Zelaya: *Neill* 2573 (Z), 4069 (Ld), 4541 (Ld); *W. D. Stevens* 8173 (Ld), 8580 (Z), 8599 (Ld).

CITHAREXYLUM MYRIANTHUM Cham.

Additional bibliography: D. Dietr., *Syn. Pl.* 3: 614. 1843; Mold., *Phytologia* 41: 109--110 & 114. 1978; Kummrow, *Bol. Mus. Bot. Munic.* 38: 14. 1979; Klein, *Sellowia* 31: 163. 1979; Mold., *Phytol. Mem.* 2: 140, 177, 185, 347, 396, & 532. 1980.

Recent collectors describe this plant as a tree, 8--10 m. tall, the trunk 10 cm. in diameter, or as a shrub, 1.5 m. tall, the fruiting-calyx olive-color, the fruit green and white spotted when young, scarlet when mature. They have encountered it in

rainforests and in sand in low woodlands, at 50--1100 m. altitude, in anthesis in November, in fruit in February. The corollas are said to have been "white" on *Hatschbach* 41728 & 42605. Kummrow (1979) cites *Hatschbach* 13623 from Paraná, Brazil. The *Irwin & al.* 32458, cited below, exhibits remarkably small-sized (although apparently mature) leaves.

Material of *C. myrianthum* has been misidentified and distributed in some herbaria as *C. montevidense* (Spreng.) Mold.

Additional citations: BRAZIL: Bahia: *Almeide & Santos* 258 (Ld); *Irwin, Harley, & Smith* 32458 (N, Z); *T. S. Santos* 565 (Ld). Espírito Santo: *Pinheiro & Santos* 2284 (Ld). Paraná: *Hatschbach* 41728 (N), 42605 (Ld). Rio de Janeiro: *Carauta & Arruda* 2313 [Herb. FEEMA 12746] (N). São Paulo: *Prance, Shepherd, & Benson* 6929 (W--2883631). ARGENTINA: Corrientes: *Krapovickas, Cristóbal, Arbo, Maruñak, Maruñak, & Irigoyen* 16894 (Ws); *Schinini & Carnevali* 10590 (Ws).

CITHAREXYLUM OBTUSIFOLIUM Kuhlmann

Additional bibliography: Mold., *Phytologia* 41: 110. 1978; Mold., *Phytol. Mem.* 2: 140 & 532. 1980.

Additional citations: BRAZIL: Bahia: *Pinheiro* 1085 (Ld).

CITHAREXYLUM OLEINUM (Benth.) Mold.

Additional bibliography: Mold., *Phytologia* 41: 110. 1978; Mold., *Phytol. Mem.* 2: 61, 347, & 532. 1980.

Recent collectors have found this plant growing in dark-brown, shallow, rocky soil in disturbed oak-pine forests, at 2100 m. altitude, describing it as a scarce shrub, 1--3 m. tall. The corollas are said to have been "white" on *Hernández M. & Vázquez* 3472.

Additional citations: MEXICO: Hidalgo: *Hernández M. & Vázquez* 3472 (Me--276509). Querétaro: *J. Rzedowski* 31610 (Ld)

CITHAREXYLUM OVATIFOLIUM Greenm.

Additional bibliography: Mold., *Phytologia* 41: 110. 1978; Mold., *Phytol. Mem.* 2: 61 & 532. 1980.

CITHAREXYLUM PACHYPHYLLUM Mold.

Additional bibliography: Mold., *Phytologia* 41: 110. 1978; Mold., *Phytol. Mem.* 2: 132 & 532. 1980.

CITHAREXYLUM PACHYPHYLLUM var. *CANESCENS* Mold.

Additional bibliography: Mold., *Phytologia* 41: 110. 1978; Mold., *Phytol. Mem.* 2: 132 & 532. 1980.

CITHAREXYLUM PENTANDRUM Vent.

Additional & emended bibliography: Loud., *Hort. Brit.*, ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; D. Dietr., *Syn. Pl.* 3: 614--615. 1843; Urb., *Symb. Antill.* 4: 535. 1911; *Liogier, Rhodora* 67: 350. 1965; Mold., *Phytologia* 41: 111. 1978; Mold., *Phytol. Mem.* 2: 93, 95, 97, 347, 381, & 532. 1980.

CITHAREXYLUM xPERKINSI Mold.

Additional bibliography: Mold., *Phytologia* 32: 64. 1975; Mold., *Phytol. Mem.* 2: 93, 97, 382, 383, & 532. 1980; Mold., *Phytologia* 48: 271. 1981.

The *Liogier* & al. 29890, cited below, is described as having been taken from a small tree, 4--5 m. tall, the corollas white, the fruit green to yellowish, found in a wet forest, at 800 m. altitude, flowering and fruiting in October, distributed as *C. caudatum* L.

Additional citations: PUERTO RICO: *Liogier*, *Liogier*, & *Martorell* 29890 (N).

CITHAREXYLUM PERNAMBUCENSE Mold.

Additional bibliography: Mold., *Phytologia* 41: 111. 1978; Mold., *Phytol. Mem.* 2: 140 & 532. 1980.

CITHAREXYLUM POEPPIGII Walp.

Additional synonymy: *Citharexylum porppiguii* Walp. ex Mold., *Phytol. Mem.* 2: 383, in syn. 1980.

Additional bibliography: Mold., *Phytologia* 41: 107, 111--113, & 122. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18 & 19. 1979; Mold., *Phytol. Mem.* 2: 107, 114, 127, 132, 140, 347, 381--383, & 532. 1980.

Recent collectors describe this plant as a shrub or small tree, 3.5--4 m. tall, the leaves firmly membranous, dull-green above, gray-green beneath, the "fruiting-spikes" [=racemes] spreading to ascending, the flower-buds green, and the fruit red. They have encountered it on sandstone slopes and in capoeira fina on terra firme, in fruit in November. The corollas are said to have been "white" on *Silva* 809.

The *Dodson* 6002, distributed as *C. poeppigii*, actually is *C. gentryi* Mold., while *Berti* 166 is *C. macrophyllum* Poir. and *Gentry* 9810 is *C. poeppigii* var. *margaritaceum* Poepp. & Mold.

Additional citations: COLOMBIA: Meta: *Plowman, Davis, & Jacobs* 4278 (W--2838897). VENEZUELA: Táchira: *Steyermarck, Liesner, & González* 119459 (Ld). BRAZIL: Amazonas: *M. Silva* 809 (N).

CITHAREXYLUM POEPPIGII var. CALVESENS Mold.

Additional bibliography: Mold., *Phytologia* 41: 112. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 18. 1979; Mold., *Phytol. Mem.* 2: 107, 114, 127, 532, & 627. 1980.

CITHAREXYLUM POEPPIGII var. MARGARITACEUM Poepp. & Mold.

Additional synonymy: *Citharexylum poeppigii* var. *margaritaceum* Mold. ex López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 19. 1979. *Citharexylum poeppigii* var. *margaritense* Poepp. & Mold., in herb.

Additional bibliography: Mold., *Phytologia* 41: 112--113. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 19. 1979; Mold., *Phytol. Mem.* 2: 107, 127, 132, 140, 173, & 532. 1980.

Recent collectors have found this plant growing in secondary forest scrub, at 150--220 m. altitude, and describe it as a shrub

or tree, 4--20 m. tall, flowering in December and January. The corollas are said to have been "white" on *Dodson & Gentry 6348* and *Eiten 399*.

Additional citations: ECUADOR: Los Ríos: *Dodson & Gentry 6348* (Go). BRAZIL: Pará: *Eiten 399* (N).

CITHAREXYLUM PTEROCLADUM Donn. Sm.

Additional bibliography: Mold., *Phytologia* 41: 113. 1978; Mold., *Phytol. Mem.* 2: 61, 71, 74, & 532. 1980.

Recent collectors refer to this plant as a tree, 15 m. tall, and have found it growing in "selva alta subperennifolia primaria, suelo café claro con roca aflorante", at 110 m. altitude, in anthesis in March and April. The corollas are said to have been "purple" on the Dorantes collection.

Additional citations: MEXICO: Chiapas: *Miranda 7734 bis* (Me--67751, Me--68752). Veracruz: *Dorantes 2548* (N, N).

CITHAREXYLUM PUNCTATUM Greenm.

Additional bibliography: Mold., *Phytologia* 41: 113. 1978; Mold., *Phytol. Mem.* 2: 132, 173, & 532. 1980.

Recent collectors have encountered this plant growing at 4050 m. altitude, in fruit in August.

Additional citations: PERU: Ancash: *Mostacero L., Alvítez I., Boeke, Jaramillo, & Nerváez 572* (Z).

CITHAREXYLUM QUERCIFOLIUM Hayek

Additional bibliography: Mold., *Phytologia* 41: 113. 1978; Mold., *Phytol. Mem.* 2: 132 & 532. 1980.

ITHAREXYLUM QUITENSE Spreng.

Additional & emended bibliography: Sweet. *Hort. Brit.*, ed. 2, 417. 1830; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; D. Dietr., *Syn. Pl.* 3: 614. 1843; Mold., *Phytologia* 41: 113. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 19. 1979; Mold., *Phytol. Mem.* 2: 127 & 532. 1980.

CITHAREXYLUM RACEMOSUM Sessé & Moc.

Additional bibliography: Mold., *Phytologia* 41: 113. 1978; Mold., *Phytol. Mem.* 2: 61 & 532. 1980; Mold., *Phytologia* 48: 273. 1981.

Recent collectors have found this plant in fruit in March, in flower in July, growing in semi-arid habitats, at 1900 m. altitude, describing it as a scarce shrub. The corollas are said to have been "white" on the Kishler collection cited below.

Material of *C. racemosum* has been misidentified and distributed in some herbaria as *C. flabellifolium* S. Wats. or *C. brachyanthum* (A. Gray) A. Gray.

Additional citations: MEXICO: Guanajuato: *Kishler 674* (Me--274959). Oaxaca: *Miranda 8841* (Me--73258).

CITHAREXYLUM RECURVATUM Greenm.

Additional bibliography: Mold., *Phytologia* 41: 113--114. 1978;

Mold., Phytol. Mem; 2: 80, 83, 347, & 532. 1980; Mold., Phytologia 47: 360. 1981.

Mori & Kallunki describe this plant as a tree, 10--12 m. tall, the trunk to 25 cm. in diameter at breast height, with orange-colored fruit, and refer to it as "very common" in patches of disturbed forest on otherwise cutover land. They have found it in flower in April and in fruit in May.

Additional citations: PANAMA: Chiriquí: Mori & Kallunki 5615 (W--2846411), 5618 (W--2846412), 6013 (W--2846391).

CITHAREXYLUM RETICULATUM H.B.K.

Additional bibliography: D. Dietr., Syn. Pl. 3: 614. 1843; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 299 (1957) and imp. 2, 2: 299. 1974; Mold., Phytologia 41: 114 & 121. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 19. 1979; Mold., Phytol. Mem. 2: 107, 127, 132, 347, & 532. 1980.

CITHAREXYLUM RETIFORME Engelhardt

Additional bibliography: Mold., Phytologia 32: 71. 1975; Mold., Phytol. Mem. 2: 368 & 532. 1980.

CITHAREXYLUM RIGIDUM (Briq.) Mold.

Additional bibliography: Mold., Phytologia 41: 110 & 114. 1978; Mold., Phytol. Mem. 2: 140, 177, & 532. 1980.

CITHAREXYLUM RIMBACHII Mold.

Additional bibliography: Mold., Phytologia 32: 71. 1975; Mold., Phytol. Mem. 2: 127 & 532. 1980.

CITHAREXYLUM ROSEI Greenm.

Additional bibliography: Mold., Phytologia 41: 114. 1978; Mold., Phytol. Mem. 2: 61 & 532. 1980.

CITHAREXYLUM ROSEI var. *DURANGENSE* Mold.

Additional bibliography: Mold., Phytologia 32: 71. 1975; Mold., Phytol. Mem. 2: 61, 347, & 532. 1980.

CITHAREXYLUM ROSEI var. *PILOSUM* Mold.

Additional bibliography: Mold., Phytologia 41: 114. 1978; Mold., Phytol. Mem. 2: 61 & 532. 1980.

CITHAREXYLUM ROXANAE Mold.

Additional bibliography: Mold., Phytologia 41: 114. 1978; Mold., Phytol. Mem. 2: 61 & 532. 1980; Wiggins, Fl. Baja Calif. 33 & 529. 1980.

Moran describes this plant as a dense shrub, 2--3 m. tall, with a 3 m. wide spread, fastigiate branches, and red fruit, and found it "occasional" on volcanic slopes, at 1325--1340 m. altitude, flowering and fruiting in November. He records the local vernacular name, "palo de escoba".

Additional citations: MEXICO: Baja California: R. Moran 23816 (Ld), 23834 (Ld, N, W--2886995).

CITHAREXYLUM SCABRUM Sesse & Moc.

Additional bibliography: Mold., *Phytologia* 41: 114. 1978; Mold., *Phytol. Mem.* 2: 61 & 532. 1980.

CITHAREXYLUM SCHOTTII Greenm.

Additional bibliography: Mold., *Phytologia* 41: 114--115. 1978; Mold., *Phytol. Mem.* 2: 61, 80, 348, & 532. 1980.

CITHAREXYLUM SCHOTTII var. *PUBESCENS* Mold.

Additional bibliography: Mold., *Phytologia* 32: 74. 1975; Mold., *Phytol. Mem.* 2: 71 & 532. 1980.

CITHAREXYLUM SCHULZII Urb. & Ekm.

Additional & emended bibliography: H. N. & A. L. Mold., *Pl. Life* 2: 43 & 82. 1948; Mold., *Phytologia* 32: 74. 1975; Mold., *Phytol. Mem.* 2: 95 & 532. 1980.

CITHAREXYLUM SERICEUM Lodd. ex Loud., *Hort. Brit.*, ed. 1, 248. 1830.

Additional & emended bibliography: Loud., *Hort. Brit.*, ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 248. 1839; Mold., *Phytologia* 41: 115. 1978; Mold., *Phytol. Mem.* 2: 348, 381, & 532. 1980.

CITHAREXYLUM SESSAEI G. Don

Additional & emended bibliography: Metcalfe & Chalk, *Anat. Dicot.* 2: 1032. 1950; Mold., *Phytologia* 41: 115. 1978; Mold., *Phytol. Mem.* 2: 61 & 532. 1980.

Miranda has found this plant in anthesis in April.

Additional citations: MEXICO: Puebla: *Miranda* 3103 (Me--97287).

CITHAREXYLUM SHREVEI Mold.

Additional bibliography: Mold., *Phytologia* 41: 115. 1978; Mold., *Phytol. Mem.* 2: 61 & 532. 1980.

CITHAREXYLUM SOLANACEUM Cham.

Additional bibliography: D. Dietr., *Syn. Pl.* 3: 614. 1843; Mold., *Phytologia* 41: 115--116. 1978; Dombrowski & Neto, *In-forme Pesq.* 3 (21): 80 & 81. 1979; Hilz & Rimpler, *Zeitschr. Naturforsch. Wiesb.* 34C: 323, 325, & 328. 1979; Mold., *Phytol. Mem.* 2: 140, 396, & 533. 1980.

Recent collectors describe this plant as a tree, 5 m. tall, with "white" flowers [corollas], and have found it growing in capão and in secondary mata, flowering in December. The leaf-blades are sharply serrate above the middle on the Oliveira collection cited below.

Additional citations: BRAZIL: Paraná: *Hatschbach* 37348 (W--2839412); *Oliveira* 156 (Ld).

CITHAREXYLUM SOLANACEUM var. *INSOLITUM* Mold.

Additional bibliography: Mold., *Phytologia* 41: 116. 1978;

Mold., Phytol. Mem. 2: 348 & 533. 1980.

CITHAREXYLUM SOLANACEUM var. *MACROCALYX* Mold.

Additional bibliography: Mold., Phytologia 41: 116. 1978; Mold., Phytol. Mem. 2: 140 & 533. 1980.

CITHAREXYLUM SPATHULATUM Mold. & Lundell

Additional bibliography: Mold., Phytologia 41: 116. 1978; Mold., Phytol. Mem. 2: 48, 61, & 533. 1980.

CITHAREXYLUM SPINOSUM L.

Additional & emended bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 545. 1819; Loud., Hort. Brit., ed. 1, 248 (1830) and ed. 2, 248. 1832; G. Don in Loud., Hort. Brit., ed. 3, 248. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; D. Dietr., Syn. Pl. 3: 614. 1843; Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 293. 1888; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 1: 630, 633, & 634 (1908) and 2: 1021 & 1022. 1908; Knuth, Feddes Repert. Spec. Nov. Beih. 43: [Init. Fl. Venez.] 605. 1927; Stahl, Estud. Fl. Puerto Rico, ed. 2, 3: 293. 1937; Metcalfe & Chalk, Anat. Dicot. 2: 1033. 1950; Alain in León & Alain, Fl. Cuba, imp. 1, 4: 299--301. 1957; Neal, Gard. Hawaii, ed. 2, 725--726. 1965; L. H. & E. Z. Bailey, Hortus Third 275. 1976; Dumont, Mycologia 68: 250. 1976; Fournet, Fl. Illust. Phan. Guad. Mart. 1404--1406, fig. 669. 1978; Mold., Phytologia 41: 116--118. 1978; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 89. 1979; Lewalle & Lakhmiri, Arb. Ornament. Maroc 1: [13]. 1979; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 19. 1979; Troncoso in Burkart, Fl. Ilust. Entre Rios 5: 290. 1979; Mold., Phytol. Mem. 2: 85, 88, 92, 93, 95, 97--101, 103, 104, 114, 121, 124, 125, 193, 204, 218, 256, 259, 267, 291, 341, 348, 380--383, 396, & 533. 1980; Mold., Phytologia 48: 273. 1981.

Additional & emended illustrations: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 545. 1819; Fournet, Il. Illust. Guad. Mart. 1406, fig. 669. 1978; Lewalle & Lakhmiri, Arb. Ornament. Maroc 1: [13] (as *C. fruticosum*). 1979.

According to Biegel and Scott in Rhodesia this is a "non-suckering tree to 8 m. [tall], branching from [the] base, deciduous when not watered in the very dry season, the foliage more or less shiny dull green, leaves very rarely serrate [1 serrate leaf seen in 100 young plants], with many petioles dull red, flowers white, sweet-scented", growing (in cultivation) at altitudes of 950--1480 feet, flowering in January and March. Lewalle & Lakhmiri (1979) describe and illustrate a "*C. fruticosum*" as cultivated in Morocco, but the plant to which they refer is obviously *C. spinosum*.

Fournet (1978) regards as synonyms of *C. spinosum* the following: *C. caudatum* "Sw. non L.", *C. coriaceum* Desf., *C. lucidum* "Griseb. non Ch. & Schl.", and *C. quadrangulare* Jacq. He lists as a vernacular name, "bois de fer blanc".

Dumont (1976) lists leaves of this species as one of the many

hosts to the parasitic fungus, *Moellerodiscus lentus* Thwaites, based on *Thwaites 104* from Peradeniya, Sri Lanka, in the Kew herbarium.

Proctor reports the flowers of *Citharexylum spinosum* "intensely fragrant", an observation which my wife, son, and myself confirmed in Hawaii, where the tree is used as a street tree in Honolulu. The corollas were white, as Proctor also reported them on his no. 16886. Knuth (1927) cites *Ernst s.n.* from Margarita Island, Venezuela.

The *C. V. Morton 4726*, distributed as *C. spinosum*, seems better regarded as representing a form of *C. fruticosum* L.

Additional citations: LEEWARD ISLANDS: St. Kitts: *Proctor 18510* (W--2833471). WINDWARD ISLANDS: Grenada: *Proctor 16886* (W--2833510). CULTIVATED: Hawaiian Islands: *Herbst 617* (Ne--149145). Zimbabwe: *Biegel 5667* (N); *J. Scott in South. Rhodes. Govt. Herb. 263466* (N).

CITHAREXYLUM STANDLEYI Mold.

Additional bibliography: Mold., *Phytologia* 41: 119. 1978; Mold., *Phytol. Mem.* 2: 80 & 533. 1980.

CITHAREXYLUM STANDLEYI var. *MEXICANUM* Mold.

Additional bibliography: Mold., *Phytologia* 41: 119. 1978; Mold., *Phytol. Mem.* 2: 61 & 533. 1980.

CITHAREXYLUM STENOPHYLLUM Urb. & Ekm.

Additional bibliography: Mold., *Phytologia* 32: 218. 1975; Mold., *Phytol. Mem.* 2: 95 & 533. 1980.

CITHAREXYLUM STEYERMARKII Mold.

Additional bibliography: Mold., *Phytologia* 41: 119. 1978; Mold., *Phytol. Mem.* 2: 71 & 533. 1980.

CITHAREXYLUM SUBEROSUM Loes.

Additional bibliography: Mold., *Phytologia* 41: 119. 1978; Mold., *Phytol. Mem.* 2: 132 & 533. 1980.

CITHAREXYLUM SUBFLAVESCENS Blake

Additional bibliography: Mold., *Phytologia* 41: 108 & 119--120. 1978; Steyerm. & Huber, *Fl. Avila* 864. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 19. 1979; Mold., *Phytol. Mem.* 2: 107, 114, 132, 348, 381, 383, & 533. 1980.

CITHAREXYLUM SUBTHYRSOIDEUM Pittier

Additional bibliography: Knuth, *Feddes Repert. Spec. Nov. Beih.* 43: [Init. Fl. Venez.] 605. 1927; Mold., *Phytologia* 41: 120. 1978; Steyerm. & Huber, *Fl. Avila* 864, [865], & 868, fig. 301C. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 19. 1979; Mold., *Phytol. Mem.* 2: 107, 114, 371, 383, & 533. 1980.

Additional illustrations: Steyerm. & Huber, *Fl. Avila* [865], fig. 301C. 1978.

Recent collectors describe this species as a small shrub, 40 cm. to 3 m. tall, with square stems, glabrous aromatic leaves, and green to red fruit, and have found it growing in low forests, at 700 m. altitude, flowering in February, and fruiting in August and October. Others have found it as 950 m. altitude. The corollas are said to have been "white: on Ferrari 333. Berry refers to the fruits as "berries", but actually they are drupes.

Knuth (1927) cites Pittier 7234 & 9648 from Distrito Federal, Venezuela.

Additional citations: VENEZUELA: Lara: Ferrari 333 (Eu--43393). Miranda: P. Berry 1087 (N), 1640 (N).

CITHAREXYLUM SUBTRUNCATUM Mold.

Additional bibliography: Mold., *Phytologia* 32: 221. 1975; Mold., *Phytol. Mem.* 2: 140 & 533. 1980.

CITHAREXYLUM SULCATUM Mold.

Additional bibliography: Mold., *Phytologia* 41: 120. 1978; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 20. 1979; Mold., *Phytol. Mem.* 2: 107 & 533. 1980.

CITHAREXYLUM SULCATUM var. *HIRTELLUM* Mold.

Additional bibliography: Mold., *Phytologia* 32: 221--222. 1975; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 20. 1979; Mold., *Phytol. Mem.* 2: 107 & 533. 1980.

CITHAREXYLUM SVENSONII Mold.

Additional bibliography: H. N. & A. L. Mold., *Pl. Life* 2: 85. 1948; Mold., *Phytologia* 32: 222. 1975; López-Palacios, *Revist. Fac. Farm. Univ. Andes* 20: 20. 1979; Mold., *Phytol. Mem.* 2: 127 & 533. 1980.

CITHAREXYLUM TECLENSE Standl.

Additional bibliography: Mold., *Phytologia* 32: 222. 1975; Mold., *Phytol. Mem.* 2: 77, 348, & 533. 1980.

CITHAREXYLUM TERNATUM Mold.

Additional & emended bibliography: Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 298 & 299. 1957; Mold., *Phytologia* 32: 222. 1975; Mold., *Phytol. Mem.* 2: 88 & 533. 1980.

CITHAREXYLUM TETRAMERUM T. S. Brandeg.

Additional bibliography: Mold., *Phytologia* 32: 222. 1975; Mold., *Phytol. Mem.* 2: 61 & 533. 1980.

CITHAREXYLUM TRISTACHYUM Turcz.

Additional synonymy: *Citharexylum trastachyum* Turcz. ex Mold., *Phytol. Mem.* 2: 533, sphalm. 1980.

Additional & emended bibliography: Alain in León & Alain, *Fl. Cuba*, imp. 1, 4: 299 & 301. 1957; Mold., *Phytologia* 41: 121. 1978; Mold., *Phytol. Mem.* 2: 88, 93, 99, 348, 382, & 533. 1980.

CITHAREXYLUM TRISTACHYUM f. *URBANII* (O. E. Schulz) Mold.

Additional bibliography: C. D. Adams, Flow. Pl. Jamaica 633. 1972; Mold., Phytologia 41: 121. 1978; Mold., Phytol. Mem. 2: 99, 93, 383, & 533. 1980.

CITHAREXYLUM ULEI Mold.

Additional bibliography: Mold., Phytologia 41: 114 & 121. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 20. 1979; Mold., Phytol. Mem. 2: 132, 140, & 533. 1980.

CITHAREXYLUM ULEI var. *CALVESCENS* Mold.

Additional bibliography: Mold., Phytologia 41: 114 & 121. 1978; Mold., Phytol. Mem. 2: 140 & 533. 1980.

CITHAREXYLUM ULEI var. *OBOVATUM* Mold.

Additional bibliography: Mold., Phytologia 41: 114 & 121. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 20. 1979; Mold., Phytol. Mem. 2: 107 & 533. 1980.

CITHAREXYLUM VALLENSE Mold.

Additional bibliography: Mold., Phytologia 32: 224. 1975; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 20. 1979; Mold., Phytol. Mem. 2: 107 & 533. 1980.

CITHAREXYLUM VENEZUELENSE Mold.

Additional bibliography: Mold., Phytologia 41: 121--122. 1978; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 20. 1979; Mold., Phytol. Mem. 2: 114, 380, 383, & 533. 1980.

Recent collectors have described the fruit of this plant as green in color when immature and orange when ripe. They have encountered the species in tropophilous woods and areas of high savannas of *Trachypogon*, at 250--400 m. altitude, in fruit in July and August. They record the vernacular name, "totumillo".

Additional citations: VENEZUELA: Bolívar: *Delascio Ch. & Liesner 7015* (E--2774720). Falcón: *González 1016* (E--2746567).

CITHAREXYLUM VIRIDE Mold.

Additional bibliography: Mold., Phytologia 41: 122. 1978; Mold., Phytol. Mem. 2: 71, 80, 83, & 533. 1980.

Recent collectors describe this plant as a tree, 50 feet tall, the fruit orange in color, and have found it growing along roadsides, in cutover forests, coffee plantations, and cloudforests, at 900--1000 m. altitude, in fruit in October. The Raven collection cited below bears a notation "not matched at Field Museum".

Additional citations: NICARAGUA: Boaco: *Stevens, Grijalva, & Araquistain 14575* (Ld). COSTA RICA: Puntarenas: *Raven 21536* (Go).

CITHAREXYLUM WEBERBAUERI Hayek

Additional bibliography: Mold., Phytologia 41: 122. 1978; Hocking, Excerpt. Bot. A.33: 91. 1979; Mold., Phytol. Mem. 2: 132 & 533. ;980.

NOTES ON THE GENUS HOLMSKIOLDIA (VERBENACEAE)

Harold N. Moldenke

Lack of time this late in life prevents the preparation of the detailed monograph of this genus as was originally planned and announced, but it has been thought worthwhile to place on record here the bibliographic and herbarium notes on the genus assembled by my wife, Alma L. Moldenke, and myself over the past fifty-two years. Full explanation of the herbarium acronyms employed have been published in previous papers and are repeated in PHYTOLOGIA MEMOIRS 2: 463--469 (1980) and are the same as used by me in my series of papers on 62 other genera in this and some other journals.

HOLMSKIOLDIA Retz., Obs. Bot. 6: 31. 1791.

Synonymy: *Hastingsia* König ex J. E. Sm., Exot. Bot. 2: 41, pl. 80. 1806 [not *Hastingsia* König ex Endl., 1966]. *Platunium* A. L. Juss., Ann. Mus. Hist. Nat. Paris 7: 76. 1806. *Hastingsia* J. E. Sm. apud Reichenb., Conspect. Reg. Veg. 1: 117. 1828. *Holmskia* Dumort., Anal. Fam. Pl. 22. 1829. *Holmskioldia* Bocq., Adansonia, ser. 1, 3: 184, sphalm. 1862. *Holmskjöldia* Retz. ex Kuntze, Rev. Gen. Pl. 2: 588. 1891. *Holmskiöldia* Retz. apud Gamble, Man. Indian Timb., ed. 2, imp. 1, 544. 1902. *Platinium* Juss. apud DeWild., Icon. Select. Hort. Then. 4: pl. 159, in syn. 1903. *Platunum* A. Juss. apud Dalla Torre & Harms, Gen. Siphonog. 433. 1904. *Florissantia* Knowlton, Proc. U. S. Nat. Mus. 51: 270. 1916. *Hastingsia* König apud H. Hallier, Meded. Rijks Herb. Leid. 37: 84, in syn. 1918 [not *Hastingsia* S. Wats., 1879]. *Holmskjoeldia* Retz. ex H. J. Lam, Verbenac. Malay. Arch. 321. 1919. *Holmskjoldia* Retz ex Porsch., Jahrb. Wiss. Bot. 63: 565, 577, 584, & 656--659, fig. 1--4. 1923. *Holmskioldia* Navarro Haydon, Fl. Com. Puerto Rico [15]. 1936. *Hastingsia* J. E. Sm. ex Mold., Prelim. Alph. List Inv. Names 26, in syn. 1940. *Platunium* Juss. ex Mold., Suppl. List Inv. Names 6, in syn. 1941. *Holmskioldia* Helfer ex Mold., Alph. List Inv. Names Suppl. 1: 10, in syn. 1947. *Holmskioldia* Thorel ex Mold., Résumé Suppl. 3: 32, in syn. 1962. *Hastingsia* P. & K. apud Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 522, in syn. 1966. *Holmskioldia* Fourn., Imp. Tree Fam. Costa Rica 13. 1966. *Hastingsia* "König ex Sm." apud Mold., Résumé Suppl. 16: 22, in syn. 1968. *Holmskioldia* Retz. apud Misra, Bull. Bot. Surv. India 12: 136, sphalm. 1970. *Holmskiöldia* Retz. ex Mold., Phytologia 23: 432. 1972. *Holmskia* Retz. ex Anon., Commonw. Myc. Inst. Ind. Fung. 3N 823, sphalm. 1972. *Holmskjöldia* Pleyte ex Mold., Phytologia 26: 373, in syn. 1973. *Holmskioldia* Woodrow ex Mold., Phytologia 31: 400, in syn. 1975. *Holmskioldia* Thorel ex López-Palacios, Fl. Venez. Verb. 323, in syn. 1977. *Holmskioldia* López-Palacios, Fl. Venez. Verb. 649, in syn. 1977. *Holmskioldea* Retz. ex Kannan, Journ. Bomb. Nat. Hist. Soc. 75 (suppl.): 1050, sphalm. 1980.

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Straggling or climbing glabrous or incanous-pubescent shrubs or trees, unarmed or armed with small axillary spines aiding in climbing; branches often elongate and more or less clambering, obtusely and often obscurely tetragonal; leaves simple, decussate-opposite, petiolate, deciduous, entire or dentate, exstipulate, often glandular-dotted beneath; inflorescence cymose or racemiform, spuriously axillary and short-pedunculate in the axils of the upper cauline leaves or foliaceous bracts, or crowded at the apex of the branchlets in terminal fashion, leafy, short, few-flowered, the higher ones often 1-flowered and the apex of the panicle then racemiform; bracts often small, deciduous; bracteoles absent; calyx gamosepalous, large, rotate or broadly obconic to patelliformly patent above the short basal urceolate tube, membranous, often highly colored, very much accrescent in age, entire and subtruncate to very broad and more or less obscurely 5-lobed, often very venose, inferior; corolla gamopetalous, tubular or hypocrateriform, zygomorphic, the tube cylindric, incurved, slightly antrorsely ampliate, the limb oblique, spreading, shortly 5-lobed or -parted, the lobes usually short, unequal, the 2 posterior ones exterior in bud, the 2 lateral ones smaller, the anterior

one largest; stamens 4 or 5, didynamous, inserted in the corolla-tube at or below the middle, shortly exserted; anthers ovate or ovoid, the 2 thecae parallel; pistil single, composed of 2 bilocular carpels; style single, terminal, filiform, slightly exserted; stigma shortly bifid or bilobed, the posterior lobe short and obtuse, the anterior one long and thin; ovary superior, bicarpellary, rotund, very obtuse and entire or apically obscurely depressed or 4-lobed, 4-locular, the cells 1-ovulate; ovules lateral, solitary, subpendulous, affixed in the upper anterior angle of the locule; fruiting-calyx much enlarged, wide-spreading, patelliform or rotate, often brightly colored, often 2 cm. or more in width, almost enclosing the fruit at its contracted base; fruit drupaceous or capsular, obovoid, apically truncate and shortly to divaricately and deeply 2--4-lobed or even almost 4-horned, usually more or less enclosed in the urceolate base of the persistent calyx-tube, the exocarp often somewhat juicy, the mesocarp thin, the endocarp hard, splitting into 1--4 nutlets or bony pyrenes; seeds oblong, exalbuminous, the testa membranous.

Type species: *Holmskioldia sanguinea* Retz.

This is a small genus of about 19 or 20 specific and subspecific taxa native to southern Asia, southeastern Africa, and Madagascar; one species widely cultivated and often escaped and more or less naturalized in both the East and West Indies and elsewhere; 2 fossil species are known from the Eocene, Miocene, and Oligocene of North America. There is said to be a form of the genus with "greenish-yellow calyx and corolla" which may or may not prove to be *H. sanguinea* f. *citrina* Mold.

The genus is named in honor of Theodor Holmskjöld [né Holm] (1732--1794), a Danish nobleman who wrote on the flora of Denmark. Benth (1876), Gürke (1895), Chittenden (1951), Preston (1969), and Palmer & Pitman (1972) regarded the genus as comprising only 3 species; Briquet (1895) and Dalla Torre & Harms (1904) gave the number as 3 or 4; Jafri & Ghafoor (Flora of West Pakistan, mss.) as 6; the Baileys (1976) and Encke (1960) as 10; López-Palacios (1977) as 11; and Angely (1956) as 14. The natural distribution is usually given as paleotropic from the Himalaya region of India, east-central Africa, and Madagascar.

Vernacular and common names for the members of the genus include "Chinese-hat", "holmskioldia", "holmskioldie", "Japanese-hat", and "parasol-flower", but these apply mostly to the type species, *H. sanguinea* Retz.

The genus belongs in the *Didynania Angiospermia* of Linnaeus; Tribe *Viteae* Schau., Subtribe *Viticeae* (Bartl.) Schau. of Schauer (1847); Tribe *Viticeae* (Bartl.) Benth. of Benth (1876); and Subfamily *Viticoideae* Briq., Tribe *Clerodendreae* Briq. of Briquet (1895). Reichenbach (1828) and Firminger (1874) placed it in the *Labiatae* [*Lamiaceae*].

An interesting comment is made by Lindley (1823) in speaking of the scientific generic name, *Holmskioldia*: "The appellation has been criticized as uncouth to our utterance, but still we suspect it will be more easily pronounced by an Englishman, than the generic one so justly derived from our monosyllable Smith can

be by a Dane or indeed any foreigner."

The fossil genus, *Florissantia*, is based on *F. physalis* Knowlton from the Miocene at Florissant, Colorado, now known as *Holmskioldia speirii* (Lesq.) MacGinitie.

The *Hastingsia* S. Wats. (1879), referred to in the generic synonymy above is a synonym of *Schoenolirion* Durand in the *Liliaceae*, while *Hastingsia* "König ex Endl." [apud Willis] is a synonym of *Abroma* Jacq. in the *Sterculiaceae*. In regard to *Hastingsia* "P. & K.", Airy Shaw (1966) credits this name to Post & Kuntze, but these authors in their *Lexicon*, p. 267 (1904) definitely and very plainly credit the name to J. E. Smith, but Smith, in turn (1806), plainly credits it to König! The Smith reference, incidentally, is erroneously cited as published in "1805" by Dalla Torre & Harms (1904).

It is worth noting here, once again, that, according to Bentham's own account ["On the joint and separate work of the authors of Bentham and Hooker's *Genera Plantarum*" in *Journ. Linn. Soc. Lond. Bot.* 20: 304--308. 1883], the entire treatment of the *Verbenaceae* in that work was by Bentham alone. Most writers on this group erroneously credit the verbenaceous discussions to both Bentham & Hooker.

Compton (1966) lists an unidentified species of *Holmskioldia* from the poorts of Swaziland -- this probably will prove to be *H. tettensis* (Klotzsch) Vatke. Mukherjee's (1965) listing of an unidentified species from the "creeper jungles" of West Bengal probably applies to *H. sanguinea* Retz.

Dr. Gillett has written to me several times concerning an as yet undescribed and unnamed species in Kenya, represented by *Faden*, *Faden*, *Gillett*, & *Gachathi* 77/439 in my personal herbarium. He states that it is a narrow-crowned tree, about 12 m. tall, with tan-colored bark peeling off with the permanent lenticels, the leaves opposite, their blades oblong, about 30 cm. long and 15 cm. wide, with dense reticulate venation, and the mature fruiting-calyx 6 cm. wide. It was collected only in the fruiting stage in February on limestone rodes with *Commiphora zimmermannii*, *Erythrina saculeuxii*, *Ficus* sp., *Gyrocarpus americana*, *Sterculia appendiculata*, *Ricinodendron* sp., etc., just north of Nwara Kenya on the Chonyi to Ribe road 4.8 km. north of the turn-off on the Kilifi to Kalolena road, at 30°47' S., 39°42' E. at about 140 m. altitude. He reports only a single tree and a single sapling were observed. This plant certainly cannot represent any presently known species in the genus and I hope that flowering material may eventually be collected, something which Dr. Gillett writes me that he is continuing to try to do.

Sweet (1839) asserts that "*Holmskioldia* occurs in p. 546 [of his work], under *Labiatae*, and in p. 551, in *Verbenaceae*; it is doubtful which of the two genera will ultimately stand; the latter, however, may be altered to *Hastingsia* for the present." Actually, there is no homonymous genus in the *Lamiaceae*.

Junell (1934), basing his work on an *Herb. Forest Fl. Siwalis & Jaunsur Div. s.n.* collection of *H. sanguinea* Retz., says for the genus *Holmskioldia*:

"Der Fruchtknoten ist schwach lobiert.....Die Plazenten verwachsen verhältnismässig hoch oben im Fruchtknoten. (Bei den vorhergehenden Arten sind die Plazenten bis nahe an den Grund der Fruchtknotenhöhle getrennt.) Die Fruchtblattränder bleiben jedoch auch bei dieser Gattung von einander frei. Die mittleren Partien der Fruchtblätter sind schwach verdickt. Sowohl aussen am Fruchtknoten als auf den Plazenten und besonders auf den Samenanlagen kommen reichlich grosse Drüsen vor.....Wie bei *Oxera*, *Faradaya* und *Hosea* sind die Samenanlagen mit ihrem chalazen Teil an der Plazenta befestigt. Der Embryosack ist oben etwas erweitert. Dieser Subtribus kann möglicherweise in zwei Gruppen getrennt werden. Bei den Gattungen *Faradaya*, *Oxera*, *Hosea* und *Holmskioldia* sind nämlich die Samenanlagen ungewöhnlich hoch inseriert und mit ihrem chalazen Teil an der Plazenta befestigt; bei den übrigen Gattungen hingegen sind sie unmittelbar oberhalb der Mitte der Samenanlage inseriert."

Gibbs (1974) reports saponins "absent or probably absent" and tannins definitely absent in the genus. An unidentified member of the genus is said to be host to the parasitic fungus, *Cercospora holmskioldiae*.

The *C. Smith* 297, identified and distributed in some herbaria as *Holmskioldia* sp., actually is *Nyctanthes arbor-tristis* L., *Pleyte* 722 is *Petraeovitex multiflora* (J. E. Sm.) Merr., and *Jenkins* s.n. [Assam] is *Premna esculenta* Roxb.

Excluded species:

- Hastingsia alba* S. Wats., Proc. Amer. Acad. 14: 242. 1879 =
Schoenolirion album (S. Wats.) Durand, Liliaceae
Hastingsia bracteosa S. Wats., Proc. Amer. Acad. 20: 377. 1885 =
Schoenolirion bracteosum (S. Wats.) Durand, Liliaceae
Holmskioldia angustifolia Mold., Bull. Torrey Bot. Club 77: 397.
 1950 = *Capitanopsis angustifolia* (Mold.) Capuron, Lamiaceae

An artificial key to the accepted taxa of *Holmskioldia*:

1. Fossil species.
 2. Calyx unlobed, about 3.2 cm. wide; Eocene of British Columbia.....*H. guilchenensis*.
 - 2a. Calyx distinctly angulate-lobed, about 5 cm. wide; Miocene of Colorado and Oligocene of Montana.....*H. speirii*.
- 1a. Modern species.
 3. Fruiting-calyx about 6 cm. wide.....*H. sp. nov. ined.*
 - 3a. Fruiting-calyx only 1.2--3.5 cm. wide.
 4. Branches spiny.
 5. Leaf-blades narrowed to the base.....*H. spinescens*.
 - 5a. Leaf-blades basally rounded.....*H. mucronata*.
 - 4a. Branches unarmed.
 6. Native to continental Africa.
 7. Leaf-blades distinctly toothed.
 8. Corollas white.....*H. tettensis* f. *alba*.
 - 8a. Corollas lilac or violet to purple.
 9. Calyx pink.....*H. tettensis*.
 - 9a. Calyx yellow.....*H. tettensis* f. *flava*.
 - 7a. Leaf-blades entire or subentire.....*H. subintegra*.

- 6a. Native to tropical Asia or Madagascar, not Africa.
- 10. Native only to Madagascar.
- 11. Leaf-blades glabrous or very obscurely pilosulous beneath.
- 12. Mature fruiting-calyx about 1.5 cm. in diameter; mature leaves 1.5--3 cm. long. *H. microphylla* var. *glabrescens*.
- 12a. Mature fruiting-calyx to 3.3 cm. in diameter; mature leaves 3.5--9 cm. long.
- 13. Lobes of fruiting-calyx separate almost to the base; fruit about 7 mm. long and wide. *H. mira* var. *fissa*.
- 13a. Lobes of fruiting-calyx separate only to the middle or slightly beyond; fruit about 4 mm. long and wide.....*H. mira*.
- 11a. Leaf-blades densely pubescent, puberulent, or tomentose beneath.
- 14. Leaf-blades densely tomentose beneath....*H. microcalyx*.
- 14a. Leaf-blades merely pubescent or puberulent beneath.
- 15. Leaf-blades densely appressed white-canescient beneath, small, 5--27 mm. long, 5--12 mm. wide, basally cuneate; mature fruiting-calyx about 1 cm. in diameter...
.....*H. microphylla*.
- 15a. Leaf-blades not appressed white-canescient beneath, larger, 4--8 cm. long and 2--4 cm. wide.
- 16. Leaf-blades apically attenuate-acute; petioles 15--20 mm. long.....*H. madagascariensis*.
- 16a. Leaf-blades apically obtuse, rounded, or emarginate; petioles only 5--10 mm. long.
- 17. Mature fruiting-calyx 2.5--3.5 cm. in diameter....
.....*H. microcalyx* var. *glabrescens*.
- 17a. Mature fruiting-calyx about 2 cm. in diameter....
.....*H. humberti*.
- 10a. Native only to tropical Asia, widely cultivated elsewhere.
- 18. Corollas red or orange.....*H. sanguinea*.
- 18a. Corollas yellow.....*H. sanguinea* f. *citrina*.

HOLMSKIOLDIA HUMBERTI Mold., Bull. Torrey Bot. Club 77: 398. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 398. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 119. 1953; Mold. in Humbert, Fl. Madag. 174: 254, 261, & 263--264, fig. 42 (5 & 6). 1956; Mold., Résumé 156 & 456. 1959; Mold., Fifth Summ. 1: 261 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 261, fig. 42* (5 & 6). 1956.

Shrub or small tree, about 2 m. tall; branchlets very slender, rather irregular, corky-lenticellate, not plainly tetragonal, minutely puberulent or glabrescent; twigs abbreviated, rather densely puberulent; nodes not annulate; principal internodes much abbreviated, 0.2--2 cm. long; leaves decussate-opposite; leaf-scars rather large and prominent, corky; buds densely tomentellous; petioles slender, 7--10 mm. long, densely puberulent with subappressed antrorse hairs; leaf-blades subcoriaceous, grayish-green on both surfaces, broadly elliptic or short-ovate, 3--4.3 cm. long, 2.2--3.7 cm. wide, apically obtuse or rounded, marginally entire, basal-

ly rounded, finely puberulent above (more densely so along the midrib), very densely puberulent or cano-tomentose and resinous-punctate beneath; midrib slender, mostly subimpressed above, prominent beneath; secondaries slender, 4--6 per side, arcuate-ascending, subimpressed above, prominent beneath, joined in many loops some distance from the margins; vein and veinlet reticulation very abundant, rather conspicuously subimpressed above, prominent to the ultimate divisions beneath; inflorescence axillary, 1-flowered, subequaling or shorter than the subtending leaf; peduncles filiform, 1.5--2 cm. long, rather densely spreading-puberulent; pedicels filiform, 7--10 mm. long, densely spreading-puberulent; bractlets caducous; corolla yellow-green; fruiting-calyx patelliform, star-shaped, thin-textured, about 2 cm. wide, venose, puberulent on both surfaces, more densely so on the outer surface, its tube campanulate, about 6 mm. long, the 5 lobes somewhat unequal, broadly elliptic, 7--8 mm. long, apically obtuse; fruit oblate-spheroid, about 5 mm. wide, thin-textured, densely puberulent and more or less resinous-punctate.

This endemic species of northwestern Madagascar is based on a collection made by Dr. Henri Humbert (no. 19032) in the tropophilous forest near Ambodimagadro, in the limestone hills and plateaus of Ankarana, Diego-Suarez, Madagascar, at an altitude of 150--200 m., collected between December, 1937, and January, 1938, and deposited in the Paris herbarium. Bernardi reports it as "apparently rare" and encountered it in flower and fruit in November.

Citations: MADAGASCAR: *Bernardi* 11258 (Ac, N); *Humbert* 19032 (N--isotype, P--type).

HOLMSKIOLDIA MADAGASCARIENSIS Mold., Bull. Torrey Bot. Club 77: 398--399. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 398--399. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 119. 1953; Mold. in Humbert, Fl. Madag. 174: 259 & 261--263, fig. 42 (4). 1956; Mold., Résumé 156 & 456. 1959; Mold., Fifth Summ. 1: 261 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 261, fig. 42 (4). 1956.

Shrub or tree; branchlets irregular, dark, rather slender, not plainly tetragonal, appressed-puberulent, glabrescent in age; twigs very slender, very densely short-pubescent with sordid-grayish hairs; nodes not annulate; principal internodes 0.3--2 cm. long, mostly greatly abbreviated; leaf-scars very large and prominent, corky-margined; leaves decussate-opposite; petioles very slender, 1.3--2 cm. long, densely short-pubescent with appressed whitish antrorse hairs; leaf-blades firmly chartaceous or subcoriaceous, light-green above (brunnescent in drying when immature), whitish beneath, lanceolate-ovate, 4--8 cm. long, 1.8--4 cm. wide, apically acute, basally mostly acute and occasionally asymmetric, marginally entire, rather densely short-pubescent with subappressed whitish hairs above, very densely short-pubescent (especially on the venation to its ultimate divisions) beneath,

the hairs whitish and subappressed; midrib slender, subimpressed above, prominent beneath; secondaries slender, 4--6 per side, arcuate-ascending, subimpressed above, prominent beneath; vein and veinlet reticulation very abundant, rather conspicuous and subimpressed above, very prominent beneath; inflorescence axillary on the young twigs, shorter than the subtending leaf; peduncles solitary in each axil, very slender, 1.3--2.1 cm. long, very densely short-pubescent like the twigs, usually 1-flowered and with a single pair of bractlets; pedicels very slender, 5--9 mm. long, very densely short-pubescent like the twigs; bractlets linear, 3--4 mm. long, densely short-pubescent; calyx campanulate, very densely white-tomentellous, its tube about 4 mm. long and wide, its 5 lobes 3--4 mm. long, broadly ovate, apically acute; corolla densely white-tomentellous on the outer surface; fruiting-calyx patelliform, star-shaped, herbaceous, about 2 cm. wide, very densely short-pubescent or tomentellous on both surfaces, the lobes broadly ovate, about 6 mm. long and wide, apically acute.

The species is based on *Service Forestier 50* from Ankara-fantsika, in the Seventh Reserve, Madagascar, collected sometime before April 4, 1933, and deposited in the Paris herbarium. The species is probably endemic to low altitude woods on limestone plateaus in western Madagascar. The type collection is erroneously given as "30" in Humbert's *Flora* (1956).

Citations: MADAGASCAR: *Service Forestier 50* (F--photo of type, N--photo of type, P--type, Z--photo of type).

HOLMSKIOLDIA MICROCALYX (J. G. Baker) Pieper, Engl. Bot. Jahrb. 62: Beibl. 141: 80. 1928.

Synonymy: *Vitex microcalyx* J. G. Baker, Journ. Linn. Soc. Lond. Bot. 25: 341. 1890. *Vitex macrocalyx* J. G. Baker ex Mold. in Humbert, Fl. Madag. 174: 260, in syn. 1956. *Holmskioldia macrocalyx* (J. G. Baker) Pieper ex Mold. in Humbert, Fl. Madag. 174: 260, in syn. 1956.

Bibliography: J. G. Baker, Journ. Linn. Soc. Lond. Bot. 25: 341. 1890; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 457. 1906; Pieper, Engl. Bot. Jahrb. 62: Beibl. 141: 80. 1928; A. W. Hill, Ind. Kew. Suppl. 8: 119. 1933; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 457. 1941; Mold. in Humbert, Fl. Madag. 174: 253 & 260--262, fig. 42 (1 & 2). 1956; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 457. 1959; Mold., Résumé 156, 298, 386, 418, & 456. 1959; Mold., Fifth Summ. 1: 261 (1971) and 2: 527, 721, 722, 775, & 880. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 261, fig. 42 (1 & 2). 1956.

Shrub or tree, 2--2.5 m. tall; branchlets medium to slender, rather irregular, dark, obtusely tetragonal, densely puberulent when young, soon glabrescent, sometimes corky-lenticellate; twigs slender, very densely short-pubescent with sordid-cinereous hairs; nodes not annulate; principal internodes usually 2--7 mm. long on the twigs, sometimes elongate to 3 cm. on the branchlets;

leaf-scars very large and divergent-prominent, very corky; buds densely villosulous; leaves decussate-opposite, short-petiolate; petioles slender, 0.8--2 cm. long, very densely short-pubescent or villosulous with sordid-cinereous or flavidous hairs; leaf-blades subcoriaceous or coriaceous, elliptic or ovate-elliptic to broadly ovate, 2--10 cm. long, 2--9.5 cm. wide, apically obtuse or rounded (sometimes even subemarginate), marginally entire, basally varying from subacute or obtuse to truncate or even deeply cordate, densely velutinous on both surfaces or obscurely albidous-pubescent above and densely so beneath; midrib rather stout, mostly subprominulous above, very prominent beneath; secondaries slender, 4--6 per side, arcuate-ascending, often somewhat subimpressed above, prominent beneath; vein and veinlet reticulation abundant, obscure or subimpressed above, prominent beneath; inflorescence axillary or terminal, 1--3-flowered; peduncles very slender, 1--3 cm. long, very densely villosulous; pedicels filiform, 4--19 mm. long, very densely villosulous; bractlets linear, to 5 mm. long, densely short-pubescent; calyx very densely villosulous throughout, the tube campanulate, about 3 mm. long and wide, its 5 lobes broadly ovate, about 3 mm. long and wide, apically acute; corolla almost 1.5 cm. long, externally densely pubescent; stamens and pistil long-exserted, 2.5--3 cm. long; fruiting-calyx patelliform, star-shaped, firmly chartaceous or coriaceous, 2.5--3.5 cm. wide, its tube densely villosulous on both surfaces, the 5 somewhat unequal lobes rather densely short-pubescent on both surfaces, venose, broadly elliptic or semi-orbicular, apically rounded or short-cuspidate; fruit oblate-spheroid or depressed-globose, about 5 mm. wide, thin-textured, densely villosulous.

This endemic species of eastern, western, and central Madagascar is based on *Baron 5369* ["next 5390"] from Madagascar, deposited in the Kew herbarium. The plant has been collected in "bois sablonneux secs", "pentes rocailleuses (rochers siliceux)", and "exceptionnellement forêt orientale", at 800--1000 m. altitude, flowering and fruiting in October. Dandouau comments "un seul arbre que les indigènes ne reconnaissent plus, relié de l'ancienne forêt orientale".

Citations: MADAGASCAR: *Baron 5369* (K--type, N--photo of type, P--isotype, Z--photo of type); *Dandouau s.n.* [Herb. Perrier 18587] (P); *Decary 8183* (N, P); *Humbert 3009* (P); *Ferrier 1123* (P), *10212* (N, P); *Perrière 1123* (P); *Sourig 237* (N, P).

HOLMSKIOLDIA MICROCALYX var. *GLABRESCENS* Mold., Bull. Torrey Bot. Club 77: 399. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 399. 1950; Mold. in Humbert, Fl. Madag. 174: 254 & 261--262, fig. 42 (3). 1956; Mold., Résumé 156 & 456. 1959; Mold., Fifth Summ. 1: 261 (1971) and 2: 881. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980. Illustrations: Mold. in Humbert, Fl. Madag. 174: 261, fig. 42 (3). 1956.

This variety differs from the typical form of the species in having its leaves merely chartaceous, lightly puberulent, and

with elevated venation above, lightly puberulent and resinous-punctate beneath, and the fruiting-calyx merely lightly and very obscurely puberulent on both surfaces.

The plant is said to be a tree, 12 m. tall, with a trunk diameter to 40 cm. It is endemic to Madagascar, based on *Service Forestier* 17 from sandy slopes, at an altitude of 100 m., in the Seventh Reserve of western Madagascar, collected sometime before April 4, 1933, and deposited in the Paris herbarium. It has been found in anthesis in November, its wood is used locally in construction, and a recorded vernacular name is "mafangalaty". Thus far it is known only from the original collection.

Citations: MADAGASCAR: *Service Forestier* 17 (F--photo of type, N--isotype, N--photo of type, P--type, Z--photo of type).

HOLMSKIOLDIA MICROPHYLLA Mold., Bull. Torrey Bot. Club 77: 399--400. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 399--400. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 119. 1953; Mold. in Humbert, Fl. Madag. 174: 254, 255, & 256--258, fig. 41 (5--8). 1956; Mold., Résumé 156 & 456. 1959; Mold., Fifth Summ. 1:262 (1971) and 2: 881. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 255, fig. 41 (5--8). 1956.

Shrub or small tree, to 2 m. tall; branches and branchlets very slender, brunnescient in drying, densely appressed-puberulent when young, glabrescent in age, very obscurely tetragonal or subterete, sometimes conspicuously lenticellate with round, corky lenticels; nodes not annulate; principal internodes 0.5--2 cm. long or less; leaf-scars comparatively large, prominent, corky; buds densely tomentose; leaves decussate-opposite, abundant, small; petioles very slender, 2--11 mm. long, densely white-tomentellous; leaf-blades thin-chartaceous, gray-green above, whitish beneath, varying from ovate or orbicular to elliptic, 0.6--2.7 cm. long, 0.5--2 cm. wide, apically rounded or emarginate, marginally entire, basally subacute or rounded, densely short-pubescent or puberulent above, very densely matted-tomentellous with white hairs beneath; midrib slender, flat or obscure above, prominulous beneath; secondaries very slender, 3 or 4 per side, arcuate-ascending, obscure or indiscernible above, prominulous beneath, they and the midrib sometimes very prominent beneath, arcuately joined some distance from the margins beneath; vein and veinlet reticulation usually indiscernible above, sometimes prominulous beneath; inflorescence axillary, usually branched and several-flowered, sometimes merely 1-flowered; peduncles filiform, 7--15 mm. long, densely white-pubescent with very short subappressed antrorse hairs; pedicels filiform, 4--5 mm. long, densely white-pubescent like the peduncles and inflorescence-branches; bractlets linear, 1--2 mm. long, densely white-pubescent with appressed antrorse hairs; calyx patelliform, its tube about 4 mm. long, densely white-pubescent with appressed antrorse hairs, its limb 5-lobed, the lobes about 3 mm. long and 2.5 mm. wide, apically subacute, densely

puberulent on both surfaces; corolla white or greenish, with one violet or pale-violet lobe or suffused with violet throughout, its tube about 6 mm. long, externally densely white-pubescent, the lobes 5, unequal, 5--10 mm. long, the inner one cucullate in bud, enlarged, irregularly dentate, clawed, membranous-margined; stamens and pistil long-exserted, the stamens 4, inserted near the summit of the corolla-tube, the filaments basally pilose; ovary tomentulose; fruiting-calyx much enlarged, 1.2--1.9 cm. wide, very densely white-pubescent on both surfaces, the 5 lobes linguulate, 3.5--4 mm. long, usually shorter than or equaling the tube; fruit oblate-spheroid, about 4 mm. wide, densely white-pubescent.

This endemic species of southwestern Madagascar is based on *Decary 9402* from the upper valley of the Mananbolo river, collected on November 24, 1931, and deposited in the Paris herbarium. Vernacular names recorded for the plant are "forimbitiky", "hasota", and "hazombaza". Collectors have encountered it on gneiss, in xerophilous bush among limestone rocks, and on limestone hillslopes and rocky plateaus, at 2--600 m. altitude, in flower from November to January, and in fruit from November to February as well as in June and August. The species is said to inhabit "Bush xérophile, forêt sèche; forêt basse sclérophyle, à basse ou moyenne alt. (jusqu'à 900 m.) Sur coteaux calcaires, rocailles, gneiss, dunes....Le bois sert à faire des pirogues, des charpentes....les feuilles son utilisées comme médicament dans les maladies des yeux."

The corollas are said to have been "white" on *Humbert 12908* and "greenish with one pale-violet petal" on *Decary 9507*.

Citations: *MADAGASCAR: Afzelius s.n.* [Béhéra, 28.12.1912] (S), *s.n.* [20.10.1912] (S); *Collector undetermined 281* (P); *Decary 9320* (P), *9402* (F--photo of type, N--photo of type, P--type, Z--photo of type), *9507* (P); *Geay 3338* (P); *Humbert 5196* (P), *6895* (N, P), *12761* (P), *12830* (P), *12908* (P), *19831* (P), *20242* (P); *Perrier 10235* (P).

HOLMSKIOLDIA MICROPHYLLA var. *GLABRESCENS* Mold., Bull. Torrey Bot. Club 77: 400. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 400. 1950; Mold. in *Humbert, Fl. Madag.* 174: 253, 255, & 258, fig. 41 (9). 1956; Mold., *Résumé* 156 & 456. 1959; Mold., *Fifth Summ.* 1: 262 (1971) and 2: 881. 1971; Mold., *Phytol. Mem.* 2: 250 & 550. 1980. Illustrations: Mold. in *Humbert, Fl. Madag.* 174: 255, fig. 41 (9). 1956.

This variety differs from the typical form of the species in having its leaves and calyxes only very finely appressed-puberulent or even subglabrescent and resinous-punctate.

The variety is based on *Humbert 20048* from a tropophilous forest and xerophytic bush on reddish-brown sand, at 80--150 m. altitude, in the neighborhood of Manombo in the forest region of Isonto west of Ankililoaka, in southwestern Madagascar, collected on January 28, 1947, and deposited in the Paris herbarium. So far it is known only from the original collection.

Citations: MADAGASCAR: *Humbert 20048* (F--photo of type, It--photo of type, N--isotype, N--photo of type, Z--photo of type).

HOLMSKIOLDIA MIRA Mold., Bull. Torrey Bot. Club 77: 400--401. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 400--401. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 119. 1953; Mold. in *Humbert. Fl. Madag.* 174: 243, 255, & 258--259, fig. 41 (10 & 11). 1956; Mold., Résumé 156 & 456. 1959; Becker, Geol. Soc. Am. Mem. 82: 87 & 119, pl. 30, fig. 4 & 7. 1961; Mold., Fifth Summ. 1: 262 (1971) and 2: 881. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in *Humbert, Fl. Madag.* 174: 255, fig. 41 (10 & 11). 1956; Becker, Geol. Soc. Am. Mem. 82: pl. 30, fig. 4 & 7. 1961.

A shrub or small tree, to 5 m. tall or more; branches and branchlets slender, gray, lenticellate, very obscurely tetragonal or subterete, glabrous; leaf-scars large and prominent, corky; lenticels often prominent and corky; buds densely tomentose-villous; nodes not annulate; principal internodes 0.2--3.5 cm. long, those on the twigs usually much abbreviated; leaves decussate-opposite, aromatic; petioles slender, 3--12 mm. long, canaliculate above and there rather densely pilosulous-puberulent, otherwise subglabrate; leaf-blades very thinly membranous and nigrescent or brunnescent in drying during anthesis, firmly chartaceous at maturity and then usually not nigrescent, varying from elliptic or broadly elliptic to ovoid, 3--8 cm. long, 2--5 cm. wide, apically acute or obtuse to rounded or emarginate, marginally entire, basally acute or more usually obtuse or rounded, usually lightly pilosulous along the midrib above, otherwise glabrous on both surfaces, very shiny when mature; midrib slender, flat above, prominulous beneath; secondaries slender, 5--7 per side, arcuate-divergent, mostly obscure or indiscernible at anthesis, prominent on both surfaces on mature leaves, joining in many loops some distance within the margins beneath; vein and veinlet reticulation very abundant, mostly indiscernible at time of anthesis, conspicuously prominent on both surfaces on mature leaves; inflorescence axillary; flowers solitary or paired in each axil; peduncles filiform, 1--3 cm. long, issuing from a villous cushion-like base, otherwise glabrous, bearing an opposite or subopposite pair of filiform bractlets 1.5--2 mm. long at the apex; pedicels filiform, 5--8 mm. long, glabrous; calyx patelliform, its tube 3--4 mm. long, the limb somewhat irregularly 5-lobed, membranous, 1.1--1.4 mm. wide, the lobes about 4 mm. long and 3.5--5 mm. wide, apically rounded and apiculate, glabrous on both surfaces, venose; corolla greenish- or pale grayish-blue to greenish-white or white; stamens 4, long-exserted; filaments glabrous, about 2 cm. long; pistil equaling or surpassing the stamens; fruiting-calyx much enlarged, star-shaped, firmly chartaceous, very venose and shiny, 2--3.5 cm. wide, the apically acute or rounded lobes separated only 1/2 to 2/3 to the base, glabrous on both surfaces; fruit oblate, 3--4 mm. long, about 4 mm. wide, thin-shelled, glabrous, shiny, not plainly sulcate nor ve-

nose.

This species, endemic to northwestern and perhaps central Madagascar, is based on *Service Forestier* 22 from Ankarafantsika in the Seventh Reserve, Madagascar, collected sometime before April 4, 1933, and deposited in the herbarium of the Museum National d'Histoire Naturelle in Paris.

Collectors refer to the plant as a shrub or tree, to 15 feet tall, and have encountered it on sand dunes, as well as in woods on plateaus. According to Humbert it is a "Bois sub sables, ou moins souvent rocaillies calcaires, parfois aux lisières; a basse alt." It has been collected in anthesis from September to December and in fruit in August and from October to April. The corollas are said to have been "white" on *Decary* 8196, "greenish-white" on *Decary* 8171, and "pale grayish-blue" on *Boivin* 2316. The label accompanying the last-mentioned collection is inscribed "genus novum" by someone in the Paris herbarium. Material has also been misidentified and distributed as *Clerodendrum emirnense* Bojer.

Citations: MADAGASCAR: *D'Alleizette* s.n. [Mandraka, Dec. 1905] (P); *Boivin* 2316 (P), s.n. [Madagascar, 1847-1852] (P); *Decary* 8171 (P), 8196 (P), 19027 (N, P); *Perrier* 332 (P), 1331 (N, P), 10202 (P), 10213 (P), 10291 (N, P), 11782 (P); *Pervillé* 672 (P); *Service Forestier* 22 (F--photo of type, N--photo of type, P--type, Z--photo of type).

HOLMSKIOLDIA MIRA var. *FISSA* Mold., Bull. Torrey Bot. Club 77: 401--402. 1950.

Bibliography: Mold., Bull. Torrey Bot. Club 77: 401--402. 1950; Mold. in Humbert, Fl. Madag. 174: 253, 255, & 259, fig. 41 (12). 1950; Mold., Résumé 156 & 456. 1959; Mold., Fifth Summ. 1: 262 (1971) and 2: 881. 1971; Mold., Phytol. Mem. 2: 250 & 550. 1980.

Illustrations: Mold. in Humbert, Fl. Madag. 174: 255, fig. 41 (12). 1950.

This variety differs from the typical form of the species in having its leaf-blades to 8.5 cm. long and 7.5 cm. wide, the fruiting-calyx 3.5--4.3 cm. wide, its lobes separate almost to the base (to within 5 mm. of the base), and the mature fruit about 7 mm. long and wide, very hard and woody, very shiny, brown, sulcate, and venose, splitting at maturity into 4 parts.

This endemic variety is based on *Bernier* 360 from Linguatou in northwestern Madagascar, collected in about 1834 and deposited in the Paris herbarium. *Bernier* describes the plant as 10--12 feet tall.

Material of this variety has been misidentified and distributed in some herbaria as *Turnera hildebrandtii* Boivin.

Citations: MADAGASCAR: *Bernier* 360 (F--photo of type, N--photo of type, P--type, Z--photo of type); *Boivin* 2485 (N, P); *Hildebrandt* 3376a (P).

HOLMSKIOLDIA MUCRONATA (Klotzsch) Vatke, Linnaea 43: 536. 1882.

Synonymy: *Cyclonema mucronatum* Klotzsch in Peters, Naturwiss.

Reise Mossamb. 6 (1) [Bot.]: 260. 1861. *Holmskioldia mucronata* Vatke apud Hutchins. & Corbish., Kew. Bull. Misc. Inf. 1920: 332. 1920. *Holmskioldia mucronatum* (Klotzsch) Vatke ex Mold., Alph. List Inv. Names 22, sphalm. 1942.

Bibliography: Klotzsch in Peters, Naturwiss. Reise Mossamb. 6 (1) [Bot.]: 260--261. 1861; Vatke, Linnaea 43: 536. 1882; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 679. 1893; Gürke in Engl., Pflanzenw. Ost-Afr. C: 342. 1895; J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 314 & 315. 1900; Hutchins. & Corbish., Kew Bull. Misc. Inf. 1920: 332. 1920; Hutchins. in Dyer, Flow. Pl. S. Afr. 2: pl. 49. 1922; Mold., Alph. List Inv. Names 22. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 51 & 93. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 679. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 119, 120, & 186. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 120. 1953; Mold., Résumé 149, 150, 276, 298, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 679. 1960; Mold., Fifth Summ. 1: 248, 251, & 473 (1971) and 2: 527 & 881. 1971; Mold., Phytol. Mem. 2: 237, 241, & 550. 1980.

An erect, branched, spiny, pubescent shrub, to 4 m. tall; stems grayish-white; branches short, spiny, about 5 cm. long, horizontally divaricate; branchlets opposite or alternate, short, erect, white-pubescent, spinescent; leaves opposite, short-petiolate; leaf-blades membranous, oval or ovate, 2.5--7.5 cm. long, 1.6--3 cm. wide, apically rounded-apiculate or short-cuspidate (the cusp itself apically rounded), marginally entire or very rarely sinuate-dentate (the teeth variable even on the same plant), basally rounded or those at the apex of the branchlets broader and subcordate, deep-green and sparsely pubescent above, gray-green and densely incanous-pubescent beneath; cymes corymbiform, axillary, pedunculate, finely pubescent, about 5 cm. long, solitary, few-flowered, bracteolate; peduncles 2.5--3.5 cm. long; bracts small, membranous, broadly ovate, about 3 mm. long and wide, apically short-acute, very sparsely pilose above, villous beneath, deciduous; pedicels densely villous; calyx purplish-white, membranous, patelliform, 6--8 mm. long and wide, finely pilose on both surfaces, persistent, 5-angled and 5-dentate, basally urceolately contracted; corolla zygomorphic, bright-blue, slightly shorter to longer than the calyx, glandular-pubescent on both surfaces, "somewhat like that of an *Aristolochia* in appearance", its tube very short, hardly exserted from the calyx, reclinate, the limb sub-bilabiate, unequally 5-parted, spreading; stamens 4, subdynamous, exserted; filaments densely glandular-puberulent below, sparsely so above; pistil somewhat surpassing the anthers, filiform, glabrous; ovary top-shaped, apically matted-villous or tomentose, basally glabrous, 4-celled, 4-ovulate; fruiting-calyx about 1.8 cm. wide.

This species is based on a Peters collection from Rios de Sena, Mozambique. It has been collected in anthesis in December and is said to be "very common" in Zimbabwe.

Citations: ZIMBABWE: Whellan 328 [Govt. Herb. Salisb. 18463] (N), 493 [Govt. Herb. Salisb. 31176] (Bm, N).

HOLMSKIOLDIA QUILCHENSIS Mathewes & Brooke, Syesis 4: 214 & 215, fig. 15, 16, & 18. 1971.

Synonymy: *Holmskioldia quilchensis* Mathewes & Brooke ex Mold., Phytol. Mem. 2: 368 & 550, sphalm. 1980.

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Illustrations: Mathewes & Brook, Syesis 4: 215, fig. 15, 16, & 18. 1971.

This is a fossil species known thus far only from the [fruiting] calyx, which is "wholly connate, orbicular with no visible lobation, diameter 3.2 cm; hydathodes visible and so disposed in the calyx circumference as to seemingly divide it into five approximately equal segments; primary veins either extending to margin of calyx or less commonly forking inside the margin; primary veins joined by lateral nervilles in a polygonal or rectangular reticulate pattern."

The species is known thus far only from Middle Eocene rocks in the Coldwater beds approximately 2 miles south of Quilchena, on the west side of Quilchena Creek, British Columbia, Canada, collected there in 1968 and 1969.

Mathewes & Brooke (1971) comment that "Although MacGinitie (1953) noted a similarity between the fossil *Holmskioldia speirii* and the extant *H. sanguinea* Retz., the comparability of calyx shape and venation is even stronger between *H. quilchenensis* and *H. sanguinea* due to the absence of calyx lobation.....This characteristic is the primary one used to separate *H. quilchenensis* from previously described forms. The Mid-Eocene occurrence of *Holmskioldia* at Quilchena ranks among the oldest known. The genus is cited as an especially good indicator for the Oligocene by Becker (1961). Holotype: Q97 (counterparts)."

HOLMSKIOLDIA SANGUINEA Retz., Obs. 6: 31--32. 1791.

Synonymy: *Hastingsia coccinea* J. E. Sm., Exot. Bot. 2: 41--42, pl. 80. 1806. *Platunium rubrum* A. L. Juss., Ann. Mus. Hist. Nat. Paris 7: 76. 1806. *Holmskioldia rubra* Pers., Syn. Pl. 2: 144. 1807. *Hastingsia scandens* Roxb., Hort. Beng., imp. 1, [95]. 1814; Fl. Ind., ed. 2, 3: 66. 1832. *Hastingsia augusta* König ex Lindl. in Edwards, Bot. Reg. 9: pl. 692. 1823. *Holmskioldia scandens* Sweet, Hort. Brit., ed. 1, 323. 1826. *Hastingsia coccinea* König ex Roxb., Fl. Ind., ed. 2, 3: 65--66. 1832. *Holmskioldia sanguinea* Retz. apud Gamble, Man. Indian Timb., ed. 2, imp. 1, 544. 1902. *Platinum rubrum* Juss. apud DeWild., Icon, Select. Hort. Then. 4: pl. 159, in syn. 1903. *Hastingsia angusta* König apud DeWild., Icon. Select. Hort. Then. 4: pl. 159, in syn. 1903. *Holmskioldia sanguinea* Retz. apud DeWild., Icon. Select. Hort. Then. 4: pl. 159, in syn. 1903. *Hastingsia coccinea* König apud H. Hallier, Neded. Rijks Herb. Leid. 37: 84, in syn. 1918. *Holmskioldia sanguinea* Woodrow, Gard. Trop., ed. 6, 442. 1918. *Holmskioldia sanguinea* Retz. apud H. J. Lam, Verbenac. Malay. Ar-

ch. 321. 1919. *Holmskjöldia sanguinea* Retz. apud Porsch, Jahrb. Wiss. Bot. 63: 656--669, fig. 4--13. 1923. *Hastingsia coccinea* Sm. ex Mold., Prelim. Alph. List Inv. Names 26, in syn. 1940. *Hastingsia coriacea* Wall. ex Mold., Prelim. Alph. List Inv. Names 26, in syn. 1940. *Holmskiöldia coccinea* Retz. ex Mold., Prelim. Alph. List Inv. Names 27, in syn. 1940. *Platunium rubrum* Juss. ex Mold., Suppl. List Inv. Names 7, in syn. 1941. *Holmskiöldia sanguinea* Retz. ex Mold., Suppl. List Inv. Names 3, in syn. 1941. *Holmskiöldia sanguinea* Retz. ex Mold., Alph. List Inv. Names Suppl. 1: 10, in syn. 1947. *Holmskiöldia sanguinea* L. ex Mold., Alph. List Inv. Names Suppl. 1: 11, in syn. 1947. *Holmskiöldia sanguinea* Wall. ex Mold., Résumé 299, in syn. 1959. *Homoskiöldia sanguinea* Retz. apud Misra, Bull. Bot. Surv. India 12: 135. 1970. *Hastingsia coriacea* Wall. ex Mold., Fifth Summ. 2: 526, in syn. 1971. *Holmskiöldia sanguinea* Retz. ex Mold., Phytologia 23: 432, in syn. 1972. *Holmskiöldia sanguinea* Retz. ex Mold., Phytologia 23: 432, in syn. 1972. *Holmskjöldia sanguinea* Retz. ex Mold., Phytologia 31: 400, in syn. 1975. *Holmskiöldia sanguinea* Retz. ex Mold., Phytologia 31: 400, in syn. 1975. *Holmskiöldia sanguinea* Retz. ex Kannan, Journ. Bomb. Nat. Hist. Soc. 75 [Suppl.]: 1050. 1980. *Hastingsia scandens* Roxb. ex Mold., Phytol. Mem. 2: 411, in syn. 1980. *Hastingsia coccinea* Wall., in herb.

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A large, straggling or clambering, loose or densely bushy shrub or small slender tree, to 10 m. tall and 4 m. in overall circumference, usually only a low bush, sometimes a creeper or woody vine, pubescent or glabrate, freely flowering; stems solitary or several, tetragonal, to 7 cm. in diameter; branches usually arching and swaying, sometimes long and pendent, usually erect when young, later scandent and vine-like, often starting at the base of the plant, the lowest often procumbent; branchlets and twigs very slender, rather acutely tetragonal, more or less densely and softly short-pubescent on the younger parts, becoming glabrescent in age, with a large pith; wood light-red, moderately hard, 43 pounds in weight per cubic foot, the pores large and numerous in spring wood, small and more scanty in the rest, often much subdivided, enclosed in a paler-colored tissue of loose texture, the larger pores prominent in a vertical section; medullary rays fine, numerous, producing a silver grain of narrow reddish plates; bark pale-brown to reddish-brown or grayish, smooth or rough, with short horizontal fissures and a few vertical bands, the papery exterior followed by a green layer of cambium; blaze

yellow, "cheesy"; nodes more or less obscurely annulate; principal internodes 2.5--9.3 cm. long; leaves decussate-opposite, evergreen; petioles very slender, 0.8--3 cm. long, usually not $1/4$ the length of the leaf-blade, canaliculate above, lightly and softly short-pubescent; leaf-blades membranous or thin-chartaceous, bright-green, ovate, 3--12 cm. long, 1.5--8.5 cm. wide, apically rather long-acuminate or caudate (the acumination itself 1--1.5 cm. long), marginally entire or subentire to (usually) lightly crenate-serrate with appressed often very shortly apiculate teeth, basally truncate or subtruncate to rounded or even subcordate, slightly prolonged centrally into the petiole, glabrate above, lightly short-pubescent on the venation beneath and there conspicuously glant-dotted or squamellate, often also more or less impressed-punctate above; midrib very slender, flat above, prominentulous beneath; secondaries filiform, 4 or 5 per side, ascending and rather straight, not much arcuate except near the margins where they are actually joined in many loops, flat above, very slightly prominentulous toward the midrib beneath; veinlet reticulation fine, mostly indiscernible above, flat beneath; inflorescence much abbreviated, to 5 cm. long, paniculate, axillary and subequaling or somewhat surpassing the subtending petiole, lax, or terminal and then more dense and subracemiform, composed of 2--6 opposite cymules, the cymules 3-flowered or reduced to a single long-pedicellate central flower and 2 sterile lateral bractlets; peduncles very short and slender, mostly less than 5 mm. long, scattered-pilosulous or glabrous; pedicels slender, 2--10 mm. long, scattered-pilosulous or glabrous; foliaceous bracts often present in the terminal inflorescence, ovate or elliptic, 5--20 mm. long, 4--9 mm. wide, red or dark-red to deep pink-red, orange-red, or orange, yellow-green when young, persistent, glabrescent; bractlets very minute; flowers very showy and attractive, profuse; calyx large, shallowly cupuliform or flattened and subrotate-campanulate to saucer-shaped or rotate, persistent, red or brick-red to bright-red, pale russet-red, orange-red, orange, burnt-orange, or bronze, occasionally reddish-yellow, $1/4$ to $1/3$ as long as the corolla, 2--2.5 cm. wide, thin-textured, marginally entire, shaped like a miniature Japanese umbrella or Chinaman's hat, radially reticulate-venose, the primary veins ending in very minute apiculations, externally glabrous, internally lightly scattered-pilosulous or puberulous; corolla tubular or infundibular, curvate, varying from red, russet, crimson, or scarlet to red-orange or orange, rarely red-brown, the tube 1.5--2.5 cm. long, curved, externally minutely pilosulous, the limb short, oblique, 5-lobed, 2-lipped, the lobes apically subacute or rounded, the 4 upper ones very short, the lower one declined, more than twice as long as the upper; stamens attached in the throat or at the middle of the corolla-tube, slightly exserted, declined; anthers oval, white, the 2 thecae parallel; style slender, about 2 cm. long, about equaling the stamens and parallel to them; stigma narrow, subbifid; ovary glabrous, 4-celled, 1 ovule per cell; fruiting-calyx accrescent, greatly expanded, rotate and circular or flattened, 1.5--2.5 cm. wide, papery, bronze-color or red to

orange-red or scarlet, darker than during anthesis, basally minutely pulverulent-puberulent or glabrous throughout, conspicuously reticulate-venose; fruit drupaceous or seemingly capsular, brown, globose or obovoid, to 10 mm. long and 8 mm. wide, almost dry, included in the accrescent calyx-tube, 1--4-seeded, often verruculose or rugose, apically deeply and divaricately 4-lobed to about half way down, splitting into 4 pyrenes or nutlets which are covered with white waxy droplets and 4--8 mm. long, each lobe obliquely turbinate, clavate, rugose, of the size of a small lentil. 1-celled, 1-valved, with a thick, soft, spongy texture, dark brownish-black; seeds conforming to the capsule-lobe in size and shape, the integument single, rather thick, white, soft, tough; perisperm absent; embryo erect, amygdalous, the 2 cotyledons oval, thick; plumule small, semilunar; radicle inferior, oval; chromosome number: $2n = 32$ or $n = 18$.

This is the type species of the genus and is apparently native to streambanks and ravines in the dry hills of the subtropical sub-Himalayan region of Nepal, Bhutan, Sikkim, and Bangladesh, but has been widely introduced in Sri Lanka, India, Malaysia, Indonesia, Mauritius, the West Indies, and elsewhere, and tends to escape and become naturalized in suitable climates. It is widely cultivated outdoors for ornament in subtropical and tropical lands and indoors in Europe, the United States, South Africa, and elsewhere.

No actual holotype was designated by Retzius, his original description merely stating: "Habitat in vallibus Bengalicae", but the specimen preserved in the König herbarium at Lund is probably the type and should be so considered (Fischer, 1932).

Past authors give the original native habitat of the species as "Silhet" (Don, 1839), "subtropical Himalaya" (Freeman & Williams, 1928; Nielsen, 1965), "North India" (MacMillan, 1943), "East India" (Bojer, 1837), "Burma" (Woodrow, 1910), "South Asia" (Standley, 1938), and "Southern slopes of the Himalayas" (Backer & Bakhuizen, 1965). Collett (1902) reports it from "Valleys below Simla, Subathoo" where he claims that it flowers from October to December. He gives its natural range as "Outer Himalaya, from the Sutlej to Assam and Burnah, ascending to 3000 feet." Watt (1889) reports it ascending to 4000 feet in the subtropical Himalaya from Kumaon to Bhutan and the Prome hills. Kingdon-Wards reports the species "not rare" in Burma, while Pancho refers to it as "rare" in the Philippines. Parker (1924) says that it is found in the "Sub-Himalayan tract and Outer Himalaya from Chamba eastwards" in the Pinjab, but is "not common", flowering there from October to December. Kanjilal (1939) asserts that it is "common" throughout Assam, and Rao & Rabha (1966) also found it there, while Banerjee (1968) and Misra (1970) list it from Bihar, Prain (1963) from Chota Nagpur, Mukherjee (1965) and Matthew (1966) from West Bengal, Kitamura (1959) from Nepal, Razi (1950) from Mysore, and Yamazaki (1966) from "Kumaon to Bhutan". The Baileys (1976) assert that it is "Now a characteristic plant [in cultivation] throughout the tropics".

The corollas of *Holmskioldia sanguinea* are described as "red"

by Neal (1965), Deb & al. (1969), and the Baileys (1976) and on Abbott s.n., Allard 14358, Bailey & Bailey 643, Chand 4217, Daniel 5594, Dress 1260, Duss 4701, Fryxell 1720, Hu 9084, Khan 79, López-Palacios & Idrobo 3690, Moore 6771, Nafday 163, Pancho 2908, Rosas R.71, and Standley 23666, "red or orange" (Deb, 1961), "red to orange" (Britton & Wilson, 1925), "dark-red" on Nicolson 2879, "deep-red" (Briquet, 1895), "bright-red" (Osmaston, 1927) and on Bullock 863, "light-red" on Bailey 396, "brick-red" (Sayeeduddin & Moinuddin, 1939) and on Koeltz 25771, "russet-red" on Morley 152, "brick-red or orange" (Brandis, 1906; Standley, 1938), "brick-red or somewhat orange" (Clarke, 1885), "pale-russet" on Gillis 7050, "deep orange-red" (Suwal, 1969), "red-orange or dark vermillion" (Maheshwari, 1963), "orange-red" (MacMillan, 1943) and on Moldenke & al. 28134, "red-orange" on Molina R. 14679 and Wagner 402, "red-brown" on Wood 1152, "reddish-brown" (Pal & Krishnamurthi, 1967), "brownish-red" (Smiley, 1970), "scarlet-red" on White 71, "scarlet" (Bose, 1920; Freeman & Williams, 1928; Haines, 1922; Chittenden, 1951; Graf, 1963; Preston, 1969) and on Fosberg 27077 and Stern 2110, "orange" (Degener, 1950) and on Chevalier 173, DeWolf 1914, and Read 1205, "orange-red to crimson" on Wagner 402, "R.H.S. Blood Red 820" on Peale 404, "crimson" (Kurtz, 1877) and on Koeltz 25938, "burnt-orange" (Menninger, 1953), "bright tawny-red" (Firminger, 1874), and "dark burnt-orange, the base yellowish" on Huhn 16. Stewart (1972) refers to the "large, scarlet calyxes, tinged with orange".

A yellow-flowered form of the species is f. *citrina* Mold. (which see, below). Menninger (1970) informs us that in the botanical garden at Bangalore, India, this yellow-flowered form is being cultivated as well as "a deep red-flowered" one. Other authors speak of a distinct orange-flowered form. Alexander (1971) avers that in Hong Kong "When the flowers are developing they are yellowish-pink but as they enlarge they become brick-red" -- presumably this is the typical form of the species and the orange-flowered form may deserve a form name.

The species is widely cultivated. Cheesman reports it common in Trinidad gardens, Lind & Tallantire (1962) report it cultivated in Uganda, Gledhill (1962) in Sierra Leone, Williams (1949) in Zanzibar, Bojer (1837) in Mauritius, Tingle (1967) in Hong Kong, Jafri & Chafoor (pers. comm.) in Pakistan, Nicolson (herb.) in Nepal, Sen & Naskar (1965) in India, Bose (1920) in Calcutta, Sharma (1975) in the Punjab, Burkhill (1966) in Malaysia (commenting that it "grows freely in Penang, but with difficulty in Singapore"), Lord (1964) on the east coast of Australia, Lasser (1974) in Venezuela, Pesman (1962) in Mexico, Molina (1975) in Honduras, Gooding (1965) in the Barbados, Questel (1941) on St. Bartholomew, Britton & Wilson (1925) in Puerto Rico and the Virgin Islands, Standley (1938) in Costa Rica, Calderón & Standley (1941) in El Salvador, and Freeman & Williams (1928) in Trinidad. Eggers reports it "naturalized near dwellings" on Dominica. López-Palacios reports it "perfectly acclimated" in Venezuela. My wife and I saw it cultivated in Sri Lanka and in Dr. Halbinger's garden in Mexico, and, in 1961, grown as a hedge plant in Hawaii. The

Buswell s.n. [Nov. 29, 1938], cited below, is accompanied by a label which bears no indication that the specimen was collected from a cultivated plant, but I am assuming that it was; similarly, the unnumbered Cook and Forbes collections from the University of Hawaii campus have labels that give no direct evidence to this effect, but, again, I assume that they represented cultivated (rather than naturalized) plants. On the other hand, the *Bailey 428*, *Barrow 485*, and *Orcutt 2657*, cited below as from naturalized plants, may actually be from cultivated material. The *Herb. Hort. Monac. s.n.* [1932] collection, cited below, was taken from plants cultivated in Munich from seed collected in Costa Rica.

Collectors have found *H. sanguinea* growing along cemetery walls, in dry places, roadside thickets, woodlands, and creeper jungles, in weedy overgrown gardens, in oak woods on steep sunny slopes, in full sunlight on white sandy soil, and even among mangrove vegetation. Taylor reports it from "old field edges in moist, gray-black volcanic soil" in Costa Rica. They have found it at altitudes from sealevel to 2700 m., in anthesis in every month of the year, and in fruit in September and December. Duss tells us that in the French West Indies it flowers all through the year. In Assam it is said to bloom from October to December "in the hot season and at the end of the cold season". Broadway says that it "is always in bloom" in Trinidad & Tobago. Smiley (1960) says that it "flowers much of the year, even in winter, in the tropics".

Santapau (1961) and Rao (1961) report the chromosome complement as $n = 18$, but Sharma & Mukhopadhyay (1963), Cave (1964), and Bolkhovskikh (1969) report it as $2n = 32$.

Woodrow (1910) speaks of a "red circular involucre" -- obviously referring to the rotate calyx -- and refers to the species as "a useful hardy plant in tropical gardens." Preston (1951) refers to it as a "stove evergreen" in England, thriving best in a light, rich soil. He avers that cuttings root readily in sandy soil "under glass in heat", and that the species was introduced into England from India in 1792, but Burkill (1966) gives the date of introduction as 1796. Loudon (1830) says the "*H. scandens*" form was introduced in 1824. Sweet (1826) gives the same dates, but says that the introduction was from the "E. Indies" [probably a careless error for Eastern India]. The Kew herbarium, when I worked there in 1934, contained 8 cultivated collections from Jamaica and one from Brazil. Menninger (1955) offered 1--4-foot tall seedlings at \$1 a foot to the horticultural trade. Bailey (1935) lists the Royal Palm and Hugh Evans Nurseries as offering the species at that time. The species is depicted in full color on a 6 d. postage stamp issued by Jamaica in 1966 (no. 166 in Scott's postage stamp catalogue).

Melchior (1964) and Kannan (1980) point out that *H. sanguinea* is a "bird-flower", habitually visited by birds for nectar [hummingbirds in the New World, sunbirds in the Old]. Questel (1941) observed hummingbirds in the French West Indies hovering in front of the flowers, wings rustling, boring deep into the corolla-tube with their long beaks. Porsch (1923) asserts that the species is regularly pollinated by these birds.

Brenan (1961) reports that the epidermis of the corolla is reinforced by a layer of collenchyma cells. Gibbs (1974) reports cyanogenesis absent from the leaves, syringin doubtfully absent from the stems, and the HCl/methanol test negative. The gynoeceum morphology is discussed by Junell (1934). Anatomical studies were conducted in detail by Sayeeduddin & Moinuddin (1939). Mound & Halsey (1978) report that *H. sanguinea* is one of the hosts for the whitefly, *Bemisia tabaci* (Gennadius) Takahashi.

Common and vernacular names reported for the species are: "arnamamir", "bloody holmskioldia", "bonite chino", "bougambilia" [probably erroneously applied here], "chapeau chinois", "Chinese hat", "Chinese hat plant", "Chinese hat-plant", "Chinese-hat-plant", "Chinese-hatplant", "Chinese-hats", "Chinese-umbrella", "Chinese-umbrellas", "Chinaman's hat", "Chinaman's-hat", "climbing holmskioldia", "Common Chinese hatplant", "crimson holmskioldia", "cup and saucer", "cup-and-saucer", "cup and saucer plant", "cup-and-saucer plant", "daudmaree", "dieng-skor-khnai", "flor roja", "holmskioldia", "holmskioldie", "hurmili", "Japanese-umbrellas", "japanische kamperfoetie", "jermei-snam-khnut", "jhimbiriya", "jhule phul", "kapni", "khem-juta-phang", "kul tolia", "kultolia", "kumaon" [this is erroneously listed as a vernacular name for this plant; it is merely the name of the region where it was found!], "lau-papale-pākē", "long-i-arong", "mandarin hat", "mandarin-hat", "manukataphut", "manu-kata-phul", "mei-da-kyma", "misinahchil", "misi-nasil", "misiwahchil", "moonwort", "palito chino", "paraguas chino", "paragüita chino", "paraguita de chino", "paraguitas japonés", "paraguito chino", "paragüito chino", "parasol flower", "parasol-flower", "pia e jarro", "relampagos japonés", "rithoul", "sanguine", "sarpattia", "scarlet holmskioldia", "siveltechin", "sivettachin", "sombbrero chino", "sombbrero chino", "sombbrero flower", "sombbrero-flower", "syntew-nong-smud", "trinitaria extranjera", and "wo-so".

Firminger (1918) says that in India this plant flowers in October and November, bearing "very curious flowers, in form like diminutive chamber-candlesticks, of a bright tawny red, in boundless profusion, and is then a most beautiful object; [it] requires to be cut closely in after flowering to keep it compact and within bounds. In a recently introduced variety the flowers are of a beautiful orange tint." It is propagated either by cuttings or from seed. Bor & Raizada (1954) add that "The plant will grow even in poor soil and does best in full sunshine....[It] is very popular for cut flowers for even when the corolla has fallen the calyx is pretty and very effective. Usually propagated by layers, as cuttings are sometimes hard to start." They also speak of "A variety with orange flowers has recently been introduced from Assam where it is wild. It is prettier than the type." Menninger (1953) notes that the species "has a tendency to climb, but if pruned back severely be kept as a rounded 6-foot shrub".

Encke (1963) says of it: "Prächtiger tropischer Zierstrauch, unter Glas jedoch meist nur unbefriedigend blühend und deshalb nur wenig gezogen [in Germany]. Kultur im hellen und luftigen Warmhaus in lehmig-humoser Erde. Vermehrung durch Aussaat und durch

Stecklinge im geschlossenen Warmbeet bei 25-30° [C.]."

Backer & Bakhuizen (1965) assert that in Java it is "often cultivated as an ornamental in gardens and parks", at 1--1300 m. altitude. Pal & Krishnamurthi (1967) aver that "The plant is fastidious with regard to its exposure to sunshine for normal growth. It has to be pruned carefully on completion of the flowering period or else it develops into a scrambler." They add that "A variety with deeper-coloured flowers is now available and is a distinct improvement on the type."

Lindley (1823) comments that "This very elegant plant was brought originally from China into the Botanic Garden at Calcutta [actually it was introduced into China from India first!], though native to the interior parts of Bengal. In the garden it grows to be a small tree if trained up with a single stem, but if left alone the branches spread far around from the base of the stem close to the ground and strike root. The bark is ash-coloured and tolerably smooth. The flowering [in England] is in the cold season, when nothing can exceed it in beauty."

Mair & Rehman (1962), on the basis of *Herb. Nat. Bot. Gard. Luck. 28920*, describe the pollen as follows: "3-zonicolpate, prolate (39 x 29 μ , range 35--42 x 28--32 μ). Colpi ends acute, tenuimarginate (in some grains [the] margin is interruptedly incrassate). Apocolpium diameter 8.4 μ . Exine 2.1 μ thick. Ectine almost as thick as endine, faintly granulate. The palynogram shown is typical for *Premna*, *Tectona*, *Sphenodesma* and *Symphorema* also, except for the ornamentation of [the] ectine surface."

Degener (1950) tells us that the species was introduced into Hawaii from Puerto Rico in 1914 by J. Edgar Higgins of the Hawaii Agricultural Experiment Station. "Since that time it has become a fairly common ornamental for border backgrounds, hedges and rock gardens.....In the wild state the plant is much more robust than when cultivated. In its native habitat sheep and goats eat the leaves for fodder."

Tiwari (1968) cites BIXL.3 & BXXXVIII.7 from Madhya Pradesh; Deb & al. (1969) cite Sengupta 892 & Deb 296 from Bhutan; Panigrahi (1966) cites his no. 11677 from Bihar; Deb (1961) cites his no. 359 from Manipur where the plant grows "at edges of forest all over Manipur"; Maheshwari (1963) cites his no. 587 from Delhi; Haines (1922) cites unnumbered collections by Camp, Campbell, and Wood from Bihar & Orissa; Wallich (1829) cites his no. 2087/1 from Nepal, 2087/2 from Silhet (Assam), and 2087/3 from the Botanical Garden at Calcutta. Griffith & Hyland (1966) cite U. S. D. A. Pl. Inventory 247168 as cultivated in Maryland, originally cultivated as their no. 18649 in São Paulo, Brazil. Srivastava (1976) cites his no. 1232 and notes: "Commonly planted in gardens for its petaloid, ornamental bracts; also seen near gardens probably as an escape." Gamble (1908) cites Curtis 2879 from Penang, while Lam (1919) cites Curtis 2872 from the same state, asserting that the species is naturally distributed in the subtropical Himalayas, from sealevel to 1330 m. altitude, "Often cultivated and sometimes escaped" in the Malayan Archipelago.

Hallier (1918) cites *Hallier C.130*, deposited in the Boissier and Delessert Herbaria, cultivated in Java - "Strauch mit überhängenden Zweigen; Blüthen roth", flowering in July. He gives the natural distribution as Sikkim, Assam, Khasia, and Prome.

López-Palacios (1977) cites the following collections from Venezuela: Aragua: *Badillo* 4619, *Trujillo* 5631. Distrito Federal: *Aristeguieta* 6647, *Labbiente* 20. Mérida: *Bernardi* 3115; *López-Palacios* 1702 & 2168; *Ruiz-Teran* 1201; *Ruiz-Teran & López-Palacios* 6217; *Trujillo* 3200; *Velasco* 363. Miranda: *Trujillo* 5301.

Material of *H. sanguinea* has been misidentified and distributed in some herbaria as *Clerodendrum* sp., *Gomphrena globosa*, *Rubiaceae*, and *Scrophulariaceae*. On the other hand, the *R. W. Read* 1369, distributed as typical *H. sanguinea*, actually represents *f. citrina* Mold.

The collections cited below before the "CULTIVATED" section do not bear any indication on their accompanying labels that they came from cultivated plants, so I am assuming that they represent persistents after cultivation, escaped from cultivation, waifs, or actual naturalizations.

Citations: MEXICO: Veracruz: *Rosas R.* 71 (W--2534605). COSTA RICA: Cartago: *R. J. Taylor* 4250 (N). CUBA: Havana: *Roig* 11612 (Es). Province undetermined: *Sagra* 758 (P). JAMAICA: *Orcutt* 2188 (W--1414782), 2657 (Ca--430617, W--1478356), 3674 (W--1478357). HISPANIOLA: Dominican Republic: *Allard* 14382 (N, W--1958855). PUERTO RICO: *Barker s.n.* [Hato Bay, April 7, 1921] (Ba); *DeWolf* 1914 (N); *M. J. Fisher* 19 (W--848252); *Otero* 2 (N), 231 (Mi), *M.71* (Mi). LEEWARD ISLANDS: Dominica: *Eggers* 1451 (W--1323372). WINDWARD ISLANDS: Barbados: *Barrow* 485 (N). Grenada: *L. H. Bailey* 428 (Ba). St. Lucia: *Hummel s.n.* [4/2/1958] (S). VENEZUELA: Mérida: *López-Palacios* 2168 (Ft). Miranda: *Hermanos Christianos* 192 (W--1802992). MASCARENE ISLANDS: Mauritius: *Bouton s.n.* [Herb. Hance 1925] (S). NEPAL: *Nicolson* 2879 (W--2571594); *Ram* 189 (Ca--396093); *Upafhyay* 1350 (W--2581496). INDIA: Assam: *Chand* 2463 (Mi), 4217 (Mi); *W. R. Fisher s.n.* [1880] (Bz--21374); *Herb. Hort. Bot. Calcutt. s.n.* [Khasia Hills, Oct. 1878] (Bz--21375); *Hooker & Thomson s.n.* [Mont. Khasia] (M, Mu--4918, S); *Jenkins s.n.* [Assam] (Mu--4921); *Khan* 79 in part (W--262744); *Koelz* 25771 (Mi), 25938 (Mi); *Miller s.n.* (Pd); *Native Collector s.n.* [Khasia Hills] (Bz--21383, Mu--4920); *Schlagintweit* 4315 (W--804637), 13483 (S); *Sims s.n.* [Assam & Khasia Hills] (Bz--21377, Bz--21378, Bz--21380, Bz--21381, Bz--21382, Mu--4922). Maharashtra: *Nafday* 163 (Ba). Manipur: *Bullock* 863 (N); *Grant s.n.* [Munnipore] (Le--908265-750). Rajasthan: *Kingdon-Ward* 18208 (N). Sikkim: *Craib* 402 (Bz--21373); *J. D. Hooker s.n.* [Sikkim, 3--5000 ped.] (Mu--4917, Pd, S); *Kurz s.n.* [Sikkim Terai] (Bz--21376); *Lepcha* 2667 (Ca--348577); *T. Thomson s.n.* [Sikkim] (Pd); *Treutler* 1028 (Pd). Siwalik & Jaunsar: *Bakhsh* 92 (N); *Choudhury* 91 (W--1170163, W--2638175); *Dusfripta* 81 (Ca--228135); *Khan* 79 in part (Mu--9641); *Punj* 97 (N); *K. N. Singh* 117 (N); *Sware* 105 (Pd). Tamil Nadu: *Kuriakose s.n.* [11-2-33] (N); *Moll s.n.* [Misiones Tranguibaricae] (Br). Uttar Pradesh: *Duthie* 10781 (Ca--269789, Gg--127014); *Gairola* 882 (W--1347718); *Hamid* 1482 (W--1372661); *Kalaky s.n.* (N); *Mohite R.* 45 [96] (S);

Murdia 103 (Pd); *Raizada* s.n. [Dehra Dun, 21st Nov. 1929] (N); *G. Singh* s.n. [Dehra Dun] (N); *R. R. Stewart* 17167 (Ca--972849, N, W--1942112); *Strachey & Winterbottom* 942 (Br); *Umashankar* 4956 (Bl--182263, Mu). West Bengal: *C. B. Clarke* 9950b (Bz--21379), 13214 [610] (W--802410); *W. Griffith* 6068/1 (S); *Helfer* 18 (Cm), 508 (Mu), s.n. [1836--38] (Gg--222537, I); *Mukerjee* 1277 (S). State undetermined: *Bentham* s.n. (T); *Biswas* 37 [Munsong] (We), s.n. [Singla, 23/XII/1937] (Bz--21384); *Blackburn* s.n. (T); *Bojer* s.n. [India orient.] (Mu--4916); *Chandron* s.n. [Ihano, 23rd Nov. 1927] (W--1719591); *Collector undetermined* 886/1 [Charswar] (Le--908265-730); *Falconer* 738 (T); *W. Griffith* s.n. [West Himalaya] (Mu--4919, T); *Herb. Bentham* s.n. [Ind. or.] (Mu--4927); *Herb. Hort. Bot. Calcutt.* s.n. [Singla, 23/ XII/1936] (N), s.n. [23/XII/1937] (W--175905); *Hort. Roxburgh* s.n. (Br); *Hügel* s.n. [mont. Himal. Belaspara] (Mu--4925, Mu--4926); *König* s.n. [Bantansum] (Mu--4913, Mu--7360), s.n. [Ind. orient.] (Br); *Kuntze* 6443 (N, N); *A. B. Lambert* 51 (Q); *R. W. Parker* 21691 (S); *Prain* s.n. [Mungpoo] (Pd); *Roxburgh* s.n. [12 Nov. 1796] (Br); *Voigt* s.n. (Cp, Cp, Cp); SRI LANKA: *D. Fairchild* 1040 (Ca--301229). BANGLADESH: East Bengal: *W. Griffith* 6068/1 (Mu--4924, Pd). PHILIPPINE ISLANDS: Luzon: *R. Mendoza* s.n. [Philip. Nat. Herb. 33336] (W--2212408). GREATER SUNDA ISLANDS: Java: *Bakhuizen* 3902 (Le--923138-928); *Bijhouwer* 160 (Bz--21370); *Brinkman* 355 (Bz--21363); *Dorgelo* 3178 (Le--144160-496); *Herb. Lugd.-Bat.* 202530 (Le--908232-456); *Zollinger* 683 (Le--908265-709, S). Sabah: *Melegrito* s.n. [D. D. Wood 1152] (Ca--232391). Sumatra: *Jacobson* 32 (Bz--21372); *Koch-Reichenhall* s.n. [1927] (Mu). MOLUCCA ISLANDS: Island undetermined: *DeVriese* 13 (Le--908233-1243). NEW CALEDONIA: *Ball* s.n. (W--369413). HAWAIIAN ISLANDS: Hawaii: *Meek* s.n. (Mu). CULTIVATED: Belgium: *M. Martens* s.n. (Br, Br). Brazil: *Butler* 2086 (N, Sf); *Pickel* 1354 (Sf). Burma: *O. E. White* 71 (W--2073126). California: *Eastwood* s.n. [Santa Barbara, Aug. 1916] (Gg--31099), s.n. [Santa Monica, June 28, 1928] (Gg--157412); *Greer* 1 (Sd--34578); *Herb. Univ. Calif. L. A.* s.n. [Hugh Evans garden, Santa Monica] (La, La); *McClintock* 149 in part (La), s.n. [Lower Hillside Park, Nov. 27, 1957] (Ba, Gg--411788); *R. V. Moran* 1494 (Sd--51491); *Paddock* s.n. [Dec. 1, 1947] (Ba); *Poindexter* s.n. [W. Los Angeles, June 28, 1936] (Ba); *Walther* s.n. [Santa Barbara, Jan.--Feb. 1931] (Gg--185159), s.n. [Santa Monica, Oct. 20, 1931] (Gg--189159). Cayman Islands: *N. Chevalier* 173 (N). China: *Ping* s.n. [Herb. Lingn. Univ. 10912] (W--1249662). Colombia: *Daniel* 5594 (W--2457916); *López-Palacios* 4022 (Ld); *López-Palacios & Idrobo* 3682 (N), 3690 (Ld, N); *Lopez-Palacios & Jaramillo* M.3682 (Ac). Cuba: *Roig* 7231 (Es), 11612 (Es). Dominican Republic: *Allard* 14358 (S, W--1958838). El Salvador: *P. C. Standley* 23666 (W--1139351). England: *Collector undetermined* s.n. [H. Kew 1855] (S). Florida: *Buswell* s.n. [Nov. 29, 1938] (Ba); *DeWolf* 649 (Ms--34245); *Dress* 1260 (Ba); *Gillis* 7050 (Ft--2561); *McFarlin* 6465 (Mi); *H. N. Moldenke* 21454 (Z); *R. W. Read* 1205 (Ba, Ft--2199); *P. O. Schallert* 20862 (Bl--124800), 22907 (S), 22997 (B, S, Ws); *Tisdale* s.n. [Gainesville, 19 Nov. 1937] (Fl--28047); *Vaskar* s.n. [Wildermere, 9-10-29] (Fl--21001). Germany: *Herb. Hort. Monac.* s.n. [1932] (Mu); *Herb. Kummer* s.n. [Hort.

bot. Monac., 2 Novemb. 1855] (Mu--6620); *Herb. Hort. Lips. s.n.* (Mi). Guadeloupe: *Duss* 2391 (N). Haiti: *Ekman* H.5166 (W--1412595). Hawaiian Islands: *J. Abbott* s.n. [4 March 1945] (Bz); *A. R. Cooke* s.n. [Univ. Hawaii campus, 3/ 10/54] (St); *Degener, Degener, & Munro* 28539 (N, W--2562087); *Forbes* s.n. [October 13, 1953] (St); *F. R. Fosberg* 9370 (Bi), 27077 (N, W); *J. A. Harris* C.242.275 (Bi, N); *Nitta* 47 (N); *P. Rankin* 13 [Wood 3628] (Bi); *Rock* s.n. [Sept. 18, '17] (Bi); *Storey* s.n. [Jan. 8, 1930] (Bi); *Y. Tanaka* s.n. [Dec. 4, 1929] (Bi); *Yoshinaga* s.n. [11/20/29] (Bi); *Yuncker* 3594 (Dp). Honduras: *Molina* R. 14679 (N, W--2566541); *H. E. Moore* 6771 (Ba). Hong Kong: *S. Y. Hu* 9084 (W--2711886), 9644 (W--2730999). India: *Herb. Hort. Bot. Calcutt. s.n.* (Mu--4923, Pd, T); *Shantha* 60 [Herb. Hyderabad. 163] (Hi--309618); *Wallich* 2087c (Mu--4914, Mu), s.n. [H. bot. Calcutta] (S), s.n. (Cp). Jamaica: *Morley* 152 (Mu). Java: *Bakhuizen van den Brink* 2749 (Ut--24903a), 3902 (Bz--21364); *Bakker* 7 (Bz--21371); *Eyken* s.n. [Sept. 1912] (Bz--21369); *Haagen* 318 (Bz--21368); *Hemken* 11 (Bz--21358); *Herb. Hort. Bot. Bogor.* 413 H.B. (Bz--21385, Le--92266-561), X.F.1 (Bz--21359), X.F.29 (Bz--21362), XI.G.66 (Bz--21360), XI.G.66 en a (Bz--21356, Bz--21357, Bz--21361), XI.G.68 (Bz--21354), XI.G.68a (Bz--21354, Bz--21355), XV.F.27a (Bz--26341, Bz, Bz), XV.I.IV.13 (Bz--26423), XV.J.A.XII.3 (Bz--26338, Bz--26339, Bz); *Herb. Mus. Bot. Bogor.* X.F.1 (Bz--25587), X.F.29 (Bz--25588), XI.G.66 en a (Bz--25589), XV.F.27 (Bz--26340, Bz--26555, Bz, N), XV.J.A.XII.3 (Bz--26337, N); *Leeuwen-Reijnvaan* s.n. [7 April 1911] (Bz--21367); *Van Oosten* 29 (Bz--21366), 45 (Bz--21365). Martinique: *Duss* 4701 (N). Mexico: *Dryxell* 1720 (Ba). Missouri: *Huhn* 16 (W--274554). Mozambique: *Gomes e Sousa* 3 (Ul). Pakistan: *Qureshi* s.n. [4.12.1965] (Kh); *R. R. Stewart* 29099 (Kh). Pennsylvania: *Peele* 404 (Ba). Philippine Islands: *J. V. Pancho* 2908 (Ba); *Stern* 2110 (Mi). Réunion: *Hombroen* 2 (P); *Richard* s.n. [hort. bot. Bourbon] (P, P). Singapore: *Nur* s.n. [2 Oct. 1924] (Ba). Puerto Rico: *Cowles* s.n. [April 3, 1922] (N); *Moldenke & Moldenke* 19534 (N); *R. J. Wagner* 402 (Ba, S). St. Kitts: *L. H. Bailey* 396 (Ba). Sri Lanka: *Collector undetermined* s.n. [Roy. Bot. Gard. May 1887] (Pd); *Moldenke, Moldenke, & Jayasuriya* 28134 (Ac, Gz, Ld, Pd, W--2764403); *Sumithraarachchi* 1] (Pd). Sudan: *Kassas* 106 (Gz), 665 [105] (Gz). Switzerland: *Herb. Hort. Basil. s.n.* (T). Tobago: *W. E. Broadway* 4798 (N). Trinidad: *Bailey & Bailey* s.n. [Port-of-Spain, Feb. 1921] (Ba); *W. E. Broadway* s.n. [Trin. Bot. Gard. Herb. 1377] (R, W--938229), s.n. [30 Oct. 1926] (B, B), s.n. [November 7, 1932] (I). Venezuela: *Bailey & Bailey* 643 (Ba), 1472 (Ba); *Bernardi* 3115 (N); *Ruiz-Teran & López-Palacios* 6217 (N); *Vogl* 1305 (Mu). Zaire: *RR.PP. Salesiens* 293 (Br). LOCALITY OF COLLECTION UNDETERMINED: *Collector undetermined* s.n. (Pd); *Haller* s.n. [Haram Petty] (Pd); *Herb. Alstroemer* s.n. (S); *Herb. Burman* s.n. (Le--908265-710); *Jacquemont* 2505 [Indes orient.] (W--2497116). MOUNTED ILLUSTRATIONS: *Géel*, Sert. Bot. Cl. 14. 1823 (N); *H. N. Moldenke* color slide 202 (Z); *DeWild.*, Icon. Select. Hort. Then. 159. 1903 (Br).

HOLMSKIOLDIA SANGUINEA f. *CITRINA* Mold., *Phytologia* 8: 58. 1961.

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This form differs from the typical form of the species in having its fresh corollas and calyxes both the same lemon-yellow color, the older calyxes becoming greenish-yellow and drying light-brown.

The form is based on Colin Potter *FL.1264* from a cultivated plant in the Foster Botanical Garden, Honolulu, Oahu, Hawaiian Islands, collected on September 20, 1961, and deposited in my personal herbarium. Miss Neal, in a letter to me dated September 21, 1961, says "about the *Holmskioldia* with greenish-yellow flowers: when I asked our Foster Botanical Gardens for a specimen for you (we have none in the herbarium [of Bishop Museum]) they immediately looked it up and found that their single plant was bearing a few flowers, though only recently planted out in the ground. A specimen from this they have just given us, and it is now in the press and will be sent to you soon. As their specimen was obtained locally, they do not know the source. I saw the same color form in Oct. 1955, when it was introduced by Mrs. A. Lester Marks of Honolulu, probably from some nursery on the mainland [of the U.S.A.]." All evidence points to the taxon being native to Assam.

While this is described as a "greenish-yellow" form, R. W. Read (below) refers to his plant as a "brilliant yellow flowered form"; Mrs. Parry describes her Assam plant as having the "bracts and flowers yellow". De (1939) says that "Recently I discovered a yellow-flowering variety of this species [*H. sanguinea*]." Whether all these plants represent the same form *citrina* is not certain -- possibly a greenish-yellow and a pure yellow form are here involved. Menninger (1970) says: "In the botanical garden at Bangalore, India, is a deep red-flowered form and also a bright yellow-flowered form of this plant [*H. sanguinea*]". It is not at all certain to me if the red-flowered and orange-flowered specimens cited under typical *H. sanguinea* really represent the same taxon or if two (or three) color forms are here included. Only careful field work can settle this problem.

Citations: INDIA: Assam: Parry 1193 (N). CULTIVATED: Florida: R. W. Read 1369 (Ft--2200). Hawaiian Islands: C. Potter *FL.1264* (Z--type).

HOLMSKIOLDIA SPEIRII (Lesq.) MacGinitie, Carnegie Inst. Wash.

Publ. 599: 156--157, pl. 74, fig. 1 & 2. 1953.

Synonymy: *Porana speirii* Lesq., U. S. Geol. Surv. Terr. Rep. 8: 172, pl. 28, fig. 15. 1883. "Convolvulaceous (?) flower" Kirchner,

Trans. St. Louis Acad. Sci. 8: 187, pl. 15, fig. 2. 1898.
Porana similis Knowlton, Proc. U. S. Nat. Mus. 51: 288, pl. 27, fig. 1 & 2. 1916. *Florissantia physalis* Knowlton, Proc. U. S. Nat. Mus. 51: 270. 1916. *Hydrangea bendirei* Berry, U. S. Geol. Surv. Prof. Paper 154: 251, pl. 52, fig. 7. 1929 [not *H. bendirei* (Ward) Knowlton, 1901]. *Viburnum palmatum* Chaney & Sanborn, Carnegie Inst. Wash. Publ. 439: 97, pl. 40, fig. 4. 1933.

Bibliography: Lesq., Rep. U. S. Geol. Surv. Terr. 8: 172, pl. 28, fig. 15. 1883; Ward, Rep. U. S. Geol. Surv. 5: 446. 1885; Lesq., Proc. U. S. Nat. Mus. 11: 16, pl. 8, fig. 4. 1888; Kirchner, Trans. St. Louis Acad. Sci. 8: 187, pl. 15, fig. 2. 1898; Knowlton, Cat. Cret. Tert. Pl. [Bull. U. S. Geol. Surv. 152:] 182. 1898; Knowlton, Bull. U. S. Geol. Surv. 209: 60, pl. 9, fig. 6 & 7. 1902; Knowlton, Proc. U. S. Nat. Mus. 51: 270 & 288, pl. 27, fig. 1 & 2. 1916; Knowlton, Bull. U. S. Geol. Surv. 696: 294, 323, & 499. 1919; Chaney, Carnegie Inst. Wash. Publ. 346: 66, 70, 71, 76, 80, 94, 134, & [140]. 1927; Berry, U. S. Geol. Surv. Prof. Paper 154: 251, pl. 52, fig. 7. 1929; Chaney & Sanborn, Carnegie Inst. Wash. Publ. 439: 97, pl. 40, fig. 4. 1933; Brown, Journ. Paleont. 9: 583, pl. 69, fig. 1--3. 1935; Brown, Journ. Wash. Acad. Sci. 30: 353. 1940; MacGinitie, Carnegie Inst. Wash. Publ. 599: 156--157, pl. 74, fig. 1 & 2. 1953; Mold., Résumé 266, 294, 301, 336, 379, & 456. 1959; Becker, Geol. Soc. Am. Mem. 82: 87 & 119, pl. 30. 1961; R. Pearson, Anim. Pl. Cenozoic Era 33. 1964; Becker, Nat. Hist. 74 (2): 41. 1965; Becker, Palaeontogr. B. 127: 123, pl. 39, fig. 6. 1969; Mathewes & Brooke, Sysesis 4: 215. 1971; Mold., Fifth Summ. 1: 376 (1971) and 2: 518, 531, 604, 709, 881, & 970. 1971; Mold., Phytol. Mem. 2: 368 & 550. 1980.

Illustrations: Lesq., Rep. U. S. Geol. Surv. Terr. 8: pl. 28, fig. 15. 1883; Kirchner, Trans. St. Louis Acad. Sci. 8: pl. 15, fig. 2. 1898; Knowlton, Proc. U. S. Nat. Mus. 51: pl. 27, fig. 1 & 2. 1916; Berry, U. S. Geol. Surv. Prof. Paper 154: pl. 52, fig. 7. 1929; Chaney & Sanborn, Carnegie Inst. Wash. Publ. 439: pl. 40, fig. 4. 1933; Brown, Journ. Paleont. 9: pl. 69, fig. 1--3. 1935; MacGinitie, Carnegie Inst. Wash. Publ. 599: pl. 74, fig. 1 & 2. 1953; Becker, Geol. Soc. Am. Mem. 82: pl. 30. 1961; Becker, Nat. Hist. 74 (2): 41. 1965; Becker, Palaeontogr. B. 127: pl. 39, fig. 6. 1969.

This fossil species is known only from the fruiting-calyces which are solitary, scarious in texture, borne on slender pedicels about 3 cm. long, 5-lobed, 2--5 cm. wide, the lobes connate, rather angular, deltoid, about 1/4 the radius of the calyx, basally 1.3--1.5 cm. wide, apically rounded or rather obtusely subacute, each with 5 veins diverging from the base and extending in a straight line to the margins where they unite by means of anastomosing loops, one prominent vein leading to the points of the sinuses and giving off a few lateral branches toward the extremities, the veins joined by lateral nervilles or crossties to form a conspicuous reticulum of irregularly polygonal or rectangular meshes; the pedicels slender, about 3 cm. long, apically bearing a small club-shaped expansion surmounted by a terminal ridge or ring supporting the calyx.

This fossil species, apparently known from numerous individual specimens, was supposed by some paleobotanists to represent a convolvulaceous corolla (Lesquereux, Knowlton) and by others a sterile flower of *Hydrangea* (Berry) or *Viburnum* (Chaney & Sanborn), but seems clearly to be the mature fruiting-calyx of a *Holmskioldia*, not very unlike the modern *H. sanguinea* Retz. Another supposed fossil *Porana* (*P. tenuis* Lesq., *P. cockerelli* Knowlton), similar to some species of *Heisteria* (*Oleaceae*), has been shown actually to represent a species of *Astronium* (*Anacardiaceae*).

MacGinitie (1953) has summed up the situation as follows: "The fossils leave no doubt that they are true calyces and not corollas. The length of the pedicel shows that they cannot have grown in close umbels as in *Hydrangea* or *Viburnum*. The specimen showing the calyx in side view was a valuable help in final identification. The fossil calyces correspond very closely to those of *Holmskioldia*, a large vine from subtropical and tropical southeastern Asia. *Holmskioldia sanguinea* Retzius from the southeastern Himalaya region furnishes the closest match. This positive identification as *Holmskioldia* leaves a question concerning the contrast between the habitat of the living plant and the indicated habitat of the fossil flora. It is probable that the fossil species was entirely distinct from any now living and was adapted to more temperate habitats. However, the climate of the northwestern range for the living genus, in the eastern Himalayas, is not greatly different from that of the southern Appalachians, where several species related to those of the fossil flora are now growing. *Holmskioldia* calyces have been found in fossil deposits at Fossil, Wyoming; Goshen, Cove Creek, and Bridge Creek, Oregon; and at Republic, Washington, ranging in age from Middle (or possibly Upper) Eocene to late Oligocene."

Holmskioldia speirii is based on Princeton Univ. Paleobot. Coll. 650, with hypotypes U. S. Nat. Mus. Cat. 33686, 34736, & 34737, Denver Mus. Nat. Hist. 658, and Univ. Calif. Mus. Paleobot. Ser. 3619 & 3620.

Becker (1961) comments that "Several well-defined calyces with counterparts exhibit considerable detail in outline and venation. The five connate, rounded calyx lobes are 2.3 cm in diameter, and the fossils conform to Chaney's (1927) description for *Porana* of the Crooked River specimens, as well as to those by Brown (1935, p. 483) from the Green River material. The Ruby specimens with a calyx diameter of 4.5 cm. as against 3.5 cm. for those of the Green River are some of the largest reported. MacGinitie (1953, p. 156) assigned material from Florissant to this species, but transferred it along with five other forms.....to the genus *Holmskioldia* of the *Verbenaceae*. Calyx venation of the Florissant specimens is of the *Holmskioldia* type. These Florissant calyx lobes are obtusely pointed and therefore markedly different from the Ruby specimens, the one figured by Lesquereux, and others identified by Brown (1935, Pl. 69, figs. 1, 3) from the Green River flora. Lobes of an intermediate shape have not been reported in the fossil state. Possibly the material consists of two

species. The remains of *Holmskioldia* furnish an excellent stratigraphic index for the early Cenozoic, especially the Oligocene.....Calyces of the living *Holmskioldia sanguinea* Retzius (Pl. 30, fig. 6) from subtropical areas of southeastern Asia correspond in venation most nearly with the fossil. Obtuse as well as rounded lobes occur in the living *H. mira* Moldenke (Pl. 30, figs. 4, 7) and in the smaller *H. angustifolia* Moldenke (Pl. 30, fig. 5), both from Madagascar." However, the last-named of these species has since been proved actually to be a species of the genus *Capitanopsis* S. Moore in the *Lamiaceae*.

Becker (1969) found "several 5-lobed calyces of *Holmskioldia speirii*" in the Tertiary of Beaverhead Basin in southwestern Montana. "They are 5 cm. in diameter, connate, prominently 5-veined, obtuse but with somewhat more pointed lobes, and generally larger than the Florissant specimens. The characters preclude confusion of the fossil with *Astronium*, *Hydrangea* or *Viburnum*. None of the living species is exactly like the fossil, but the generic characters are diagnostic. *Holmskioldia* is described from North America only from the upper Eocene to the late Oligocene, but may have extended into the Lower Miocene."

In a letter to me, dated April 16, 1951, Dr. MacGinitie says: "The *Verbenaceae* in the Florissant are *Petraea perplexans* (Cockerell) MacGinitie and *Holmskioldia speirii* (Lesquereux) MacGinitie. They were formerly called *Buettneria perplexans* and *Porana speirii*. These names are both founded on calyces and appear to be as certain as any paleobotanical identifications can be."

The *Hydrangea bendirei* (Ward) Knowlton, referred to in the synonymy (above), is a presently accepted fossil species based on *Marsilea bendirei* Ward [*Porana bendirei* (Ward) Lesq., 1888] from the Mascall formation in Grant County, Oregon.

HOLMSKIOLDIA SPINESCENS (Klotzsch) Vatke, *Linnaea* 43: 536. 1882.

Synonymy: *Cyclonema spinescens* Klotzsch in Peters, *Naturwiss. Reise Mossamb.* 6 [Bot.] (1): 262. 1861 [not *C. spinescens* Oliv., 1876]. *Holmskioldia spinescens* Vatke apud Hutchins. & Corbish., *Kew Bull. Misc. Inf.* 1920: 332. 1920.

Bibliography: Klotzsch in Peters, *Naturwiss. Reise Mossamb.* 6 [Bot.] (1): 262. 1861; Oliv., *Journ. Linn. Soc. Lond. Bot.* 15: 96. 1876; Hook., *Icon. Pl.* 13: pl. 1221. 1877; Vatke, *Linnaea* 43: 536. 1882; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, *inp.* 1, 1: 679. 1893; Gürke in Engl., *Pflanzenw. Ost-Afr. C.* 342. 1895; J. G. Baker in Thiselet.-Dyer, *Fl. Trop. Afr.* 5: 314. 1900; Hutchins. & Corbish., *Kew Bull. Misc. Inf.* 1920: 332. 1920; Hutchins., *Flow. Pl. S. Afr.* 2: pl. 49. 1922; Stapf, *Ind. Lond.* 2: 380. 1930; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 51 & 93. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, *inp.* 2, 1: 679. 1946; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 120 & 186. 1949; E. J. Salisb., *Ind. Kew. Suppl.* 11: 119. 1953; Mold., *Résumé* 150, 276, & 457. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, *imp.* 3, 1: 679. 1960; Mold., *Fifth Summ.* 1: 251 & 473 (1971) and 2: 881. 1971; Mold., *Phytol. Mem.* 2: 241 & 550. 1980.

Illustrations: Hook., *Icon. Pl.* 13: pl. 1221. 1877.

A many-stemmed much-branched erect shrub, to about 2.5 m. tall; stems whitish, rather flattened; branches whitish, rather flattened, armed with short, white, erect, wide-spreading, 6--8 mm. long, subulate, glabrous, and woody spines; young branchlets erect, terete, densely pubescent; leaves small, decussate-opposite, deciduous; petioles very short, terete, about 2 mm. long; leaf-blades light-green, oblong, 1.2--4 cm. long, 6--8 mm. wide, apically very shortly acute, marginally entire, basally narrowed-cuneate, slightly pubescent above, densely whitish-pubescent beneath; cymes axillary, borne at the apex of the branchlets, pedunculate, lax, few-flowered, pubescent, bracteate; bracts minute, villous, caducous; calyx in anthesis cyathiform-campanulate, 0.8--1.2 cm. wide, obtusely 5-lobed, pubescent on both surfaces, ac-crescent; corolla irregular, slightly longer than the calyx, 1.2 cm. long, externally densely pubescent, the tube short, reclinate, densely glandular, the limb unequally 5-parted, subbilabiate, patent; stamens 4, subdidynamous, long-exserted, equaling the tips of the corolla-lobes; filaments filiform, glandular-puberulent below, glabrous above; style glabrous, exserted; ovary villous or white-pubescent; fruiting-calyx rigidly coriaceous, to 2.5 cm. wide; fruit densely villous, apically deeply 4-lobed.

This species appears to be endemic to the lower part of the Zambezi valley in Tete, Mozambique, where the type was collected by Peters and the species again by Kirk. The *Cyclonema spinescens* of Oliver (1876), referred to in the synonymy (above), is a synonym of *Kalaharia uncinata* (Schinz) Mold.

The *Faden*, Gillett, & Gachathi 77/439, distributed as *H. spinescens* actually represents a new, as yet undescribed, species awaiting the collection of more complete material.

Chase refers to *H. spinescens* as a shrub, 7--8 feet tall, with simple, opposite leaves, and fruits attached to the mature calyx, and with "4-pointed seeds". He encountered the plant on hill-tops and riverbanks, at 900 feet altitude, fruiting in July.

Citations: MOZAMBIQUE: Tete: *N. C. Chase* 2217 [Govt. Herb. Salisb. 29056] (N), 2218 [Govt. Herb. Salisb. 29055] (N).

HOLMSKIOLDIA SUBINTEGRA Mold., Bol. Soc. Brot., ser. 2, 40: 122. 1966.

Bibliography: Mold., Bol. Soc. Brot., ser. 2, 40: 122. 1966; Mold., *Résumé Suppl.* 13: 4. 1966; Anon., *Assoc. Etud. Tax. Fl. Afr. Trop.* 1967: 62. 1968; Anon., *Biol. Abstr.* 49: 390. 1968; Mold., *Fifth Summ.* 1: 251 (1971) and 2: 881. 1971; Heslop-Harrison, *Ind. Kew. Suppl.* 15: 69. 1974; Mold., *Phytol. Mem.* 2: 241 & 550. 1980.

A tree, 5--7 m. tall, apparently much-branched; branchlets twiggy, conspicuously lenticellate with elevated lenticels, the youngest parts densely short-pubescent with gray hairs; principal internodes much abbreviated, 1--4 cm. long; leaves decussate-opposite or approximate, sessile or subsessile; leaf-blades firmly chartaceous or parchment-like, brunnescent in drying, lighter beneath, obovate or obovate-elliptic, usually widest above the middle, apically acute to short-cuspidate, marginally

entire or subentire-repand, basally acute, rather densely short-pilose or -pubescent above, more densely so beneath especially along the venation; secondaries about 6 per side, practically indiscernible above, prominulous beneath; inflorescence axillary, usually shorter than or equaling the subtending leaves; peduncles very slender, 2--3 cm. long, densely short-pubescent; cyme-branches 2 or 3, shorter than the peduncle, short-pubescent, divergent in fruit; fruiting-calyx firmly chartaceous, rotate, distinctly 5-lobed, conspicuously venose, pinkish, 2.5--3 cm. wide, puberulent.

The type of this apparently endemic species was collected by Eduardo Campos de Andrada (no. 1755) near Furancungo, Macanga, Tete, Mozambique, on July 14, 1949, and is deposited in the Utramar herbarium at Lisbon. Thus far it is a species known only from this type collection.

Citations: MOZAMBIQUE: Tete: *Andrade 1755* (U1--type, Z--iso-type).

HOLMSKIOLDIA TETTENSIS (Klotzsch) Vatke, *Linnaea* 43: 536. 1882.

Synonymy: *Cyclonema tettensis* Klotzsch in Peters, *Naturwiss. Reise Mossamb.* 6 [Bot.] (1): 261--262. 1861. *Holmskioldia speciosa* Hutchins. & Corbish., *Kew Bull. Misc. Inf.* 1920: 332, fig. 1. 1920. *Holmskioldia tettensis* Vatke apud Hutchins. & Corbish., *Kew Bull. Misc. Inf.* 1920: 332. 1920.

Bibliography: Klotzsch in Peters, *Naturwiss. Reise Mossamb.* 6 [Bot.] (1): 261--262. 1861; Vatke, *Linnaea* 43: 536. 1882; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 679. 1893; Gürke in Engl., *Pflanzenw. Ost-Afr. C.* 342. 1895; J. G. Baker in *Thiselt.-Dyer*, *Fl. Trop. Afr.* 5: 314. 1900; Hutchins. & Corbish., *Kew Bull. Misc. Inf.* 1920: 332--333, fig. 1--3. 1920; Hutchins. in *Dyer*, *Flow. Pl. S. Afr.* 2: pl. 49. 1922; Wangerin, *Justs Bot. Jahresber.* 51 (1): 553. 1923; A. W. Hill, *Ind. Kew. Suppl.* 6: 103. 1926; Fedde & Schust., *Justs Bot. Jahresber.* 48 (1): 498. 1927; Wangerin, *Justs Bot. Jahresber.* 49 (1): 521. 1928; Stapf, *Ind. Lond.* 3: 433. 1930; Fedde, *Justs Bot. Jahresber.* 49 (2): 436 (1932) and 51 (2): 310. 1933; Worsdell, *Ind. Lond. Suppl.* 1: 484. 1941; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 51 & 93. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 679. 1946; Neal, *Gard. Hawaii*, ed. 1, imp. 1, 645 & 783 (1948) and ed. 1, imp. 2, 645 & 783. 1949; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 120, 122, 160, & 186. 1949; Mold., *Résumé* 150, 152, 153, 219, 276, & 457. 1959; E. J. Salisb., *Ind. Kew. Suppl.* 11: 120. 1953; Kuck & Tongg, *Mod. Trop. Gard.* 109, 116, & 233. 1955; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 679. 1960; Dyer, Verdoorn, & Codd in Letty, *Wild Fls. Transv.* 280 & [282], pl. 140 (1). 1962; Mold., *Résumé Suppl.* 3: 32. 1962; H. P. Riley, *Fam. Flow. Pl. S. Afr.* 129. 1963; Neal, *Gard. Hawaii*, ed. 2, 732 & 896. 1965; F. White, *Webbia* 19: 677. 1965; R. H. Compton, *Journ. S. Afr. Bot. Suppl.* 6: 66. 1966; Mold., *Résumé Suppl.* 13: 4. 1966; Anon., *Assoc. Etud. Tax. Afr. Trop. Ind.* 1967: 62. 1968; Anon., *Biol. Abstr.* 49: 390. 1968; Van der Schijff, *Check List Vasc. Pl. Kruger Nat. Park* 81--82. 1969;

Elliovson, Compl. Gard. Book South. Hemisph., ed. 6, 160. 1970; Mold., Fifth Summ. 1: 251, 254, 256, 363, & 473 (1971) and 2: 528 & 881. 1971; Palmer & Pitman, Trees S. Afr., ed. 2, 3: 1968--1971. 1972; Mold., Phytologia 26: 368. 1973; Howes, Dict. Useful Pl. 55. 1974; Clay & Hubbard, Haw. Gard. Trop. Shrubs 198 & 290. 1977; Mold., Phytologia 36: 37. 1977; Mold., Phytol. Mem. 2: 241, 243, 245, 354, & 550. 1980.

Illustrations: Hutchins. & Corbish., Kew Bull. Misc. Inf. 1920: 333, fig. 1--3. 1920; Hutchins. in Dyer, Flow. Pl. S. Afr. 2: pl. 49 (in color). 1922; Dyer, Verdoorn, & Codd in Letty, Wild Fls. Transv. [272], pl. 140 (1) (in color). 1962; Palmer & Pittman, Trees South. Afr. 3: 1968 (in color) & 1970. 1972.

A large, erect, twiggy bush, small shrub, or slender shrubby tree, branched, very floriferous, pilose-pubescent; branches and branchlets woody, unarmed, decussate-opposite, obtusely tetragonal or terete, slender, whitish, suberect, shortly soft-pubescent or sparsely villous, with pale lenticels; twigs gray-brown; principal internodes about 2 cm. long; leaves decussate-opposite; petioles short, about 7 mm. long, plano-convex in cross-section, densely pubescent; leaf-blades soft, papyraceous, broadly ovate or obovate to oblong or triangular, 2.5--4 cm. long, 1.5--3 cm. wide, apically triangular and shortly acute, basally broadly cuneate or rounded, marginally irregularly and coarsely crenate-dentate or scalloped, with about 3, deep, wide, & blunt or rounded teeth, deep-green above and velvety to sparsely short-pubescent or very short-setulose with evanescent hairs, paler green beneath and conspicuously glandular short-pubescent especially on the venation; secondaries about 3 per side; inflorescence axillary at the tips of the branchlets, cymose or corymbose, pedunculate, few-flowered, incanous-pilose, bracteate; peduncles slender, soft-pubescent; lower bracts more or less foliaceous, spatulate-obovate or rhomboid, 6--8 mm. long, about 4 mm. wide, apically acute, puberulent on both surfaces, short-stalked, green or pale pink-mauve, caducous; pedicels 1.2--2 cm. long, densely villous, with 2 small linear opposite bracteoles above the middle; calyx cyathiform or broadly top-shaped, pink or mauve to dull pink-lilac, obtusely 5-dentate, basally urceolately contracted, externally densely villous or glandular-pubescent, gradually accrescent; corolla-buds purple-violet; corolla violet or purple to deep-blue, 2--2.5 cm. long, irregular, slightly shorter than the calyx, externally glandular soft-pubescent, the tube short, 1--1.5 cm. long, reclinate, glandulose, the limb unequally 5-lobed, subbilabiate, spreading, externally articulate-villous, the lobes apically broadly rounded; stamens 4, subdidynamous, long-exserted; filaments filiform, purple or violet, basally glandulose-puberulent, apically glabrous; anthers greenish-yellow; style a little longer than the stamens, slender, glabrous; ovary orbicular, 4-celled, externally villous throughout or only on the upper part; fruiting-calyx much accrescent, papyraceous or rigidly membranous, to 2.5 cm. wide; fruit subtriangular, broadest apically, truncate, 4-horned, included by the mature fruiting-calyx, explosively dehiscent

when mature.

The type of this species was collected by Peters "Auf Ebenen in der Umgebung von Tette", Mozambique. Klotzsch (1861) records the vernacular name, "camunga-cansomba", and speaks of the ovary as "viereugich", by which he probably means 4-celled. He also comments that the "Staubgefäße [anthers] und Griffel [style] sind in ihrer Bekleidung" the same as those of *H. spinescens*.

Hutchinson (1922) comments that this plant "when in full bloom is one of the most conspicuous objects in the veld. The calyx... very soon becomes almost fully developed, and the young corolla is at first only visible as a minute ball at the base of the saucer-shaped calyx."

The type of Hutchinson & Corbishley's *H. speciosa* was collected by I. B. Pole Evans (no. 16879) at Komanti Poort in the Limpopo basin, Transvaal, South Africa, on November 29, 1917.

Palmer & Pitman (1972) assert that "In South Africa it is confined to the north-eastern and eastern Transvaal and to Zululand -- it also occurs in Swaziland -- where it grows in mixed bushveld on rocky mountain slopes. It is common on the Lebombo Mountains. Patches of trees grow almost alongside the road on the Lydenburg side of the Abel Erasmus Tunnel, in mid and late summer making patches of soft colour". They continue: "The flowers bloom from spring to late summer....In shape and colour they are beautiful and unusual. The calyx in a mature flower is large and saucer-shaped and stiffly papery, with 5 shallow lobes, a soft pink or mauve shade. The corolla in the heart of this is first only a small ball, and this develops into a 2-lobed tube up to 2.5 cm long, violet or deep blue and softly velvety, with 4 long [h]airy stamens protruding....The Bantu name....means "to crackle" because when ripe [the fruits] explode with small crackling sounds, shooting out the seeds....It is well worth cultivating for its abundant, soft-coloured blooms."

Collectors have found this plant growing on steep hillsides and on stony or rocky mountain slopes, in open wood in lowveld, in red gritty soil of bushveld, in shallow stony soils, in *Sclerocarya-Combretum apiculatum*-*Acacia nigrescens* bush, and in woods with *Pterocarpus rotundifolius*, *Combretum* spp., *Sclerocarya caffra*, *Acacia* spp., and *Peltophorum africanum*, at 500--1000 feet altitude, in anthesis from October to April, as well as in July, and in fruit in February.

The "flowers" [=corollas?] are reported as "purple" by Kuck & Tongg (1955) and on Borle 271 and Exell & al. 471, "pale-purple" on Edwards 2944, "blue-purple" on Gillis 11046, "violet-blue" on Bayliss 10602, "blue" on Strey 6556, "dark-blue" on Van Wyk 404, "blue-pink" on Schlieben & Strey 8391, "lilac" on Barbosa 737, "violet" on Torre 1849 & 6839, "mauve" on Codd 3254, and "wine-color" on Mendonça 2964, and the corollas specifically as "violet" on Compton 28619 & 30396, "reddish-blue" on Mendonça 1658, and "pink" on Meeuse 10643. The calyx specifically is described as "lilac-rose" on Mendonça 1658, "pink" on Compton 30396, "pinkish" on Exell & al. 471, "mauve" on Meeuse 10643, and "russet" on Compton 28619.

[to be continued]

Contribution to the Lichen Flora of Venezuela, II.

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As a result of new lichenological expeditions in the western part of Venezuela and of the examination of the material studied by specialists, a new list of species has been fashioned with the new registers for Venezuela.

It is worth to mention that the genus Heterocyphelium is the first citation for Venezuela.

Cladonia anomoea (Ach.) Ahti & P. James

Estado Mérida: La Carbonera, finca "San Eusebio," cercanías de Mérida, restos de bosques andinos, López-Figueiras & M. Keogh 14080

Cladonia bacillaris Nyl.

Estado Táchira: En la vía entre Boca de Monte y El Zumbador, López-Figueiras 14427

Cladonia colombiana Sipman

Estado Táchira: Vertiente occidental de Pico Banderas, Páramo de Tamá, Hale & López-Figueiras 45276

Cladonia ochrochlora Flk.

Estado Mérida: Páramo de los Granates, alrededores de Loma de Paja, López-Figueiras 14876

Coccocarpia cronia (Tuck.) Vainio

Estado Táchira: Pico El Cobre, un sector del Páramo de Tamá, López-Figueiras & Ruiz-Terán 9982

Estado Trujillo: Carretera (en construcción) Bocono-Las Negritas, bosque andino primario, López-Figueiras & M. Keogh 11480, 11483, 11527, 11547-c, 11576, 11486

Carretera (vieja) Bocono-La Cristalina-Trujillo, López-Figueiras & M. Keogh 11225

A lo largo de la carretera Carache-La Palma-Agua de Obispo, López-Figueiras 13431

Estado Falcón: Serrania de San Luis, 40 Km S of Coro.
Along road Coro-Churuguara, c 3 Km SW of Piedra Penada, Cucaide,
Sipman & H. van der Werff 10877

Estado de Mérida: Taludes de la carretera La Mitisus-Barinita,
entre La Mitisus y Las Mesas, López-Figueiras 12416, 12442, 12448
Taludes de la via a El Morro, López-Figueiras & M. Keogh 12341,
12406

Finca San Eusebio, carretera Mérida-La Azulita, López-Figueiras
13686

Mérida, teleférico. Along path from La Aguada to La Montana,
Sipman & López-Figueiras 11136, 11246

Coccocarpia domingensis Vainio

Estado Mérida: La Carbonera, finca "San Eusebio," cercanías de
Mérida, López-Figueiras & M. Keogh 15543

Coccocarpia erythroxyli (Spreng.) Swinsc. & Krog. As C. parmelioides
(H.K.) Trev. in Varechi 1973.

Estado Trujillo: Páramo Cende, López-Figueiras 12996, 13057

Estado Merida: Mérida, teleférico. Along path from La Aguada
to La Montana, Sipman & López-Figueiras 11137

Coccocarpia pellita (Ach.) Müll. Arg.

Estado Táchira: Alrededores de Betania, parte alta del Valle
de Tamá, en bosque andino, López-Figueiras 10081

Estado Mérida: El Paramito, un sector de La Carbonera,
cercanías de Mérida, López-Figueiras 17342, 1763, 17381, 17385,
17438, 17505

El Maciegal, cuenca del río La Pedregosa, cercanías de
Mérida, López-Figueiras 10597

En Monte Zerpa, arriba de La Hechicera, cercanías de Mérida,
López-Figueiras 17288

Valley of Río Chama, near Mérida. Bottom of little tributary
valley at end of Calle Pueblecito, Sipman 11002.

Erioderma chilense Montagne

Estado Mérida: Entre Laguna Negra y Mucubaji, Sierra Nevada de
Santo Domingo, Hale & López-Figueiras 44493, 44555

El Valle, cercanías de Mérida, López-Figueiras & M. Keogh 11879

Erioderma solediatum Gallow. & P. M. Jørgensen

Estado Táchira: Base del Cobre Chiquito, Valle del Páramo de
Tamá, Hale & López-Figueiras 45635

Estado Trujillo: Finca Guirigay-Rio Burate, páramo de Guirigay, López-Figueiras & Ruiz-Terán 11075

Páramo de Motumbo, quebrada El Volcán, un afluente del Aracay, López-Figueiras 12477, 12478

Estado Mérida: Potreros de San Rafael, páramo de Las Coloradas, Hale & López-Figueiras 44347

Paramo La Negra, piedras y bosques, Hale & López-Figueiras 42596

Erioderma verruculosum Vainio

Mérida State: Taludes along via Pregoneros, Hale 42903

Erioderma wrightii Tuck.

Mérida State: Above La Aguada, Sierra Nevada de Mérida, Hale 43180

Everniastrum catawbiense (Degel.) Hale

Mérida State: Mérida teleférico. Along path La Aguada-La Montana, Sipman & López-Figueiras 11151

Páramo Mucubaji, along track from Laguna Mucubaji to Laguna Negra, Sipman & López-Figueiras 11348

Everniastrum fragile Sipman

Mérida State: Páramo de Mucubaji, along track from Laguna Mucubaji to Laguna Negra, Sipman & López-Figueiras 11343

Heterocyphellium leucampyx (Tuck.) Vainio

Estado Lara: Serranía de Bobare, en Pico-Pico, zona de bosques, López-Figueiras & R. Smith 20745

Pannaria rubiginosa (Ach.) Bory

Estado Táchira: Páramo El Batallón, López-Figueiras 10201

Páramo El Rosal, via La Grita-San José de Bolívar, Hale & López-Figueiras 45012

Estado Trujillo: Páramo Cendé, López-Figueiras 13019

Páramo El Jabón, López-Figueiras 13349

Parmelia panniformis (Nyl.) Vainio

Estado Mérida: Páramo de Mucuchies, alrededores de la torre de T. V., Hale & López-Figueiras 44609

Parmotrema fasciculatum (Vainio) Hale

Estado Mérida: Mérida teleférico. Along path La Aguada-La Montana, Sipman & López-Figueiras 11161

Placopsis gelida Nyl.

Estado Mérida: Sierra Nevada de Santo Domingo, Páramo de Mucubaji hacia La Laguna Negra, López-Figueiras & Morales 23633

Sierra del Norte o de la Culata: Páramo de Los Conejos, norte de la Laguna Tapada, López-Figueiras 23932

Parque Nacional Sierra Nevada, arriba de Los Frailes, via Apartaderos-Santo Domingo, López-Figueiras 25038

Rocella babingtonii Mont.

Estado Falcón: Peninsula de Paraguana. A lo largo de Monte Cano, zona xerófita, López-Figueiras & Wingfield 22460

Tylophoron moderatum Nyl.

Estado Mérida: Monte Zerpa, proximidades de La Hechicera, junto a la ciudad de Mérida, López-Figueiras 16160

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The author is indebted to T. Ahti; L. Arvidsson; G. Follmann; M. Hale; P. M. Jørgensen; H. Sipman and L. Tibell for the revision of the above mentioned list. Special thanks are due to Robert Smith and Robert Wingfield for their kind help during our field work in Lara and Falcón States respectively. The author also gratefully acknowledge financial support from CONICIT (grant 51-26-B10-S1: 0981) and from the Consejo de Desarrollo Científico y Humanístico, ULA (Grant FA-04-77 and FA-23-77).

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BOOK REVIEWS

Alma L. Moldenke

"JUNGLES" edited by Edward S. Ayensu, 200 pp., 150 color & b/w photos & 250 draw. & 11 maps. Crown Publishers, Inc., New York, N. Y. 10016. 1980. \$35.00 oversize.

With beautiful and copious illustrations, with effective and scientifically accurate arguments in the text, with eye-catching format and sound wildlife preservation arguments, this publication can and hopefully will convince many more people of how ultimately useless and harmful it is to cut back these wet tropical forests. To folks raised in temperate parts of the world, jungles seem so overpoweringly stable and productive that chopping trees for lumber and nibbling edges for slash-and-burn agriculture by the world's less well off peoples may seem a small human price to pay. Now the areas depleted are greatly increased by power equipment use. This study emphasizes that the jungle keeps its valuable interrelated systems functioning only if undisturbed, that it can store its excess in its tree and liana trunks, and not in the shallow soil subject to leaching on exposure so that it ends up no good for jungle regrowth, arboriculture or agriculture. It is hard to see all that lush green and yet realize that such vegetation cover is over a desert that becomes only more extreme upon exposure.

"THE FOSSIL HUNTERS - In Search of Ancient Plants" by Henry N. Andrews, iii & 422 pp., 13 full, 39 smaller b/w photo. pl. of paleontologists and 7 full pl. of fossils. Cornell University Press, London, & P. O. Box 250, Ithaca, New York 14850. 1980. \$28.50.

Scholarly yet warmly chatty, historically arranged by centuries and by countries, this valuable compilation of information becomes a source of reminiscently pleasurable reading for paleobotanists the world over, an excellent text like the author's "Ancient Plants and the World They Lived In" for beginning students in the field and a useful source book for scientists of other disciplines whose interests touch peripherally on this field. The book is nicely printed, illustrated with good photographs and quotations from many of these fossil hunters, and revives the fossil location explanation of dumping by the moving and receding waters of Noah's flood.

"A FIELD GUIDE TO THE BIRDS - A Completely New Guide to All the Birds of Eastern and Central North America" Fourth Edition by Roger Tory Peterson, 384 pp., 136 color pl., many b/w fig. & 390 distribution maps. Houghton Mifflin Company, Boston, Massachusetts 0207. 1980. \$15.00 clothbound, \$9.95 paperbound.

This book will sell itself because of its popular topic and its famous author, but I am very glad that the publishers sent me a review copy. Some folks will get both bindings - the paperbound to take into the field without concern about occasional raindrops, quickly scribbled memos and even peanut butter smears, and the clothbound to be kept at home for any later neat notation. This revision uses the Peterson System of "patternistic drawings with arrows that pinpoint the key field marks", has all color plates beautifully and accurately painted anew and arranged to face the text description. The range maps with different colors for winter, resident and breeding areas, and with pertinent annotations are prepared by Mrs. Peterson and provide information much more efficiently than text would. The edition has added descriptions and illustrations of "accidentals" from the sea, Eurasia, tropics, and the West as well as exotic introductions and escapes. The book is sponsored by the National Audubon Society and the National Wildlife Federation.

"HAWAII'S VANISHING FLORA" by Bert Y. Kimura & Kenneth M. Nagata, 88 pp., 126 color photo, 1 b/w draw., Oriental Publishing Company, P. O. Box 22162, Honolulu, Hawaii 96822. 1980. \$5.95 paperbound.

These are not the flowers seen blooming around the hotels at Waikiki, or again and again at Miami Beach, Curacao, Singapore, Bombay, Mombassa, etc. Instead, these are the endemic and established early Polynesian introductions that are seen less and less as land development progresses. Now the botanically inclined hiker or visitor has this inexpensive pocket-size book as a guide for the recognition of these treasures still remaining in spite of vandals, man's unthinking land use, and vigorous competition presented by many newly introduced plant and animal competitors. Scientific, Hawaiian, common and family names are given; so are descriptive notes, general localities, history of first collections and botanical literature sources. The photographs are well printed. The famous silversword is shown in the frontispiece. This book makes a lovely Hawaiian souvenir of Hawaii. Its plea for plant protecting is relevant and important.

"FLORA OF THE PACIFIC NORTHWEST, An Illustrated Manual" by C. Leo Hitchcock & Arthur Cronquist, xix & 730 pp., 10,000 line draw., University of Washington Press, Seattle 98105. 1978. \$25.00.

Of course, this field manual is an excellent work; it is condensed and a bit modernized from the excellent 5-volumed "Vascular Plants of the Pacific Northwest" originally published serially by this same press from 1955 to 1969 and reprinted with corrections so that this form is possibly a fourth edition. The illustrations are placed marginally next to the descriptions and/or

keys, reduced one-half from those in the "Vascular Plants" and there are some new ones added from the efficient pen of Jeanne R. Janish. Using a field magnifying lens promises to bring out more details. There are two keys to the families of these vascular plants: a synoptical more detailed one and an artificial less technical illustrated one.

"PLANT TAXONOMY AND PLANT SYSTEMATICS" by Clive A. Stace, vi & 279 pp., 15 b/w maps, 5 photo, 31 fig. & 21 tab. University Park Press, Baltimore, Maryland 21202. \$29.50 paperbound.

This is one of the new British and Commonwealth university undergraduate oriented student texts in the Contemporary Biology Series that vary from ordinary to excellent. This one is very good. "Serious amateurs, teachers and researchers who specialize in other fields but use taxonomic information will find it useful", indeed. The author presents plant taxonomy as "both the most basic and the ultimate field of biology" and develops chapters on each of its information sources: structural, chemical, chromosomal, breeding systems, plant geography, and ecology. In any taxonomic course wherein at least some students can read English, this text deserves at least a place on the reading shelf.

"DICTIONARY OF THEORETICAL CONCEPTS IN BIOLOGY" compiled by Keith E. Roe & Richard G. Frederick, xli & 267 pp., Scarecrow Press, Inc., Metuchen, N. J. 08840. 1981. \$17.50.

This bibliography without definitions provides alphabetically arranged "access to the literature on [1166] named theoretical concepts by citing original sources and reviews in which these concepts are elucidated". They "have been gleaned from journal articles, monographs, reviews, and histories of biological disciplines, primarily in the English language, published through the year 1979". Citations are arranged chronologically, incidentally showing historical development. There are ample cross-references. Over 30 introductory pages list with their abbreviations the journals that served as source material. This book will be of particular help to biology students researching problems, science historians, and especially to those kind librarians who want to help inquirers after certain biological information.

"GATHERING WHAT THE GREAT NATURE PROVIDED - Food Traditions of the Gitsan" by the People of 'Ksan, 127 pp., 1 br/w map, 1 tab, 51 photos & 36 draw., University of Washington Press, Seattle, Washington 98105. 1980. \$7.95.

Through interesting simple text, otherwise not readily accessible photography and easily identified plant drawings the Book Builders of the Gitsan Amerind tribe from along the Skeena River

in British Columbia have prepared cooperatively this record of the "histories, habits and techniques of their great-great-grand-fathers" so that their "young people can know the stature of their heritage - and share it with the world." It tells of the collection, preparation, preservation and storage of native plant and animal food sources. This area of Canada is naturally rich in edible fish, game, berries, tubers, bulbs, etc. With the early advent of Europeans' bread, potatoes, other new foods and the words denoting them have been added. This is a very attractively arranged publication whose plant illustrations are very easily recognized.

"DARWIN IN AMERICA. The Intellectual Response 1865--1912" by Cynthia Eagle Russett, ix & 229 pp., 19 b/w illus., W. H. Freeman & Company, San Francisco, California 94104. 1980. \$4.95 softcover.

This treatise first appeared in 1976 in a hardcover edition describing primarily for the college undergraduates "what happened to some important areas of American culture after permeation by Darwinian ideas. The response to Darwinism on the part of theologians, philosophers, novelists and social scientists [but not typically by assorted kinds of biologists!] was bewilderingly diverse." Veblen is considered the most complete Darwinian. The book concludes with "Two major wars have intervened between us, and a cataclysmic depression, and the atomic bomb. But the beginnings of our modern mentality are rooted in that earlier time when the ape and the angel were rallying points, and certitude lost an epic battle to ambiguity".

"HERBS AND SPICES - The Pursuit of Flavor" edited by Waverly Root, 191 pp., 171 color & 179 b/w photo., 18 fig., 43 charts & 15 maps, McGraw-Hill Book Company, New York, N. Y. 10020. 1980. \$19.95.

This is a delightful, useful book crammed with a great deal of information very attractively and effectively organized. After cooking, Neolithic man invented seasoning, first with "salt, the primordial seasoner, the only important food which comes from the mineral kingdom", and then "he drew his seasoners from the inexhaustible resources of the vegetable kingdom in the form of herbs, spices and condiments." The editor's introduction provides an interesting historical survey and his final chapters a geographical, cultural one. Paula Wolfert has compiled a chart on the use of herbs and spices as well as one on cooking with herbs. Roy Genders provides in columnar form a plant lexicon for over a hundred color-illustrated plants with their scientific, common and family names, origins, descriptions, uses and growing conditions, and also chapters on harvesting, storing, etc.

"SEED TO CIVILIZATION. The Story of Food" Second Edition by Charles B. Heiser, Jr., xii & 254 pp., 112 b/w photo., 11 fig., 5 maps & 5 tab., W. H. Freeman Company, San Francisco, California 94104. 1981. \$19.95 hardcover, \$9.95 paperbound.

Since the first edition was a worthwhile production and since the topic is increasingly pertinent because of increasing world population, this modernized revision is certainly to be welcomed. Such new topics as world hunger, sugars, world oil crops from sunflower and cotton, new finds in archeological agriculture, new food prospects such as the New Guinean winged-bean (*Psophocarpus tetragonolobus*) and the pigweed pseudocereals (*Amaranthus* spp.) larger yields resulting from heteroploidy, and efforts to combine N_2 -fixing bacteria to grain crops have been added, as well as pertinent bibliography. But imagine mentioning tea and not mentioning Sri Lanka or Ceylon!

"PLANT SYSTEMATICS" by Samuel B. Jones & Arlene E. Luchsinger, xi & 388 pp., 24 b/w photo., 90 fig. & 15 tab., McGraw-Hill Book Company, New York, N. Y. 10020. 1979. \$15.95.

This text is one of the McGraw-Hill Series in Organismic Biology, well planned for an undergraduate course, ill advised for a graduate one except on a reading shelf, and inexpensively priced, which may be of importance in some schools. No frills, no thrills, just matter-of-fact clear-cut presentation, including a good historical survey, adoption of Cronquist's classification, "primary emphasis upon the modern and dynamic application of academic and theoretical considerations to systematics", and descriptions for over 100 plant families. I particularly like the choice of an example of a description of a species new to science, *Vernonia cronquistii* S. B. Jones, because it adds a personal touch for students in the author's university and he can show them an isotype in the herbarium there and I liked the chart comparing "some families that are likely to be confused", since it will help students to limit their own confusions.

"BIOLOGICAL NOMENCLATURE" Second Edition by Charles Jeffrey, viii & 72 pp. & 3 tab., Crane, Russak & Company, Inc., New York, N. Y. 10017. 1978 \$13.00.

This book is truly a gem, just as the first edition was, because of its great value yet small size and because of its crystal clear use of language and direct explanations. It contains recent revisions of the following Nomenclatural Codes: Botanical, Horticultural, Zoological, Entomological, Bacterial and Viral. It belongs on the reading shelves of all taxonomic and/or systematic courses, in herbaria and other named collections of biota, and by the desks of all advanced students and scientists using scientific names of organisms but not needing the long and complicated codes themselves.

"CONSPECTUS FUNGORUM ESCULENTORUM" by J. Vinz. Krombholz, 42 pp., Replication Edition. 1980. Boerhaave Press, P. O. Box 1051, Leiden 2302 BB, Netherlands. Paperbound.

Since the original work appeared in 1821 in Prague for a medical congress in the Karl Ferdinand University there, precious few copies are available today. This reprint with its parallel Latin-German list of names with sources, illustrations and descriptions of edible fungi available in the Prague public markets in 1820, is therefore a taxonomic treat.

"ANNUAL REVIEW OF PHYTOPATHOLOGY" Volume 17 edited by Raymond G. Grogan, etc., vi & 552 pp., 12 b/w fig, 17 maps, 5 photo. & 22 tab. Annual Reviews, Inc. Palo Alto, California 94306. 1979. \$20.00 U.S.A. & \$21.00 foreign.

There are the usual 21 well chosen technical papers, always with new emphases such as Serological Identification of Plant Pathogenic Bacteria, Water Relations in Water Molds, and Movement of Fumigants in Soil. Under the chapter title of Historical Perspectives three different plant pathologists extol deservedly the teaching and experimental skills of L. R. Jones, Mason B. Thomas and Roland Thaxter. The Prefatory chapter, consistently one of my favorites in this series, is on Conceptualizing in Plant Pathology, by William Hewitt, now emeritus at the University of California at Davis. His professional life (like that of the above-mentioned phytopathologists) must have been inspiringly satisfying for his students and laboratory cohorts.

"ANNUAL REVIEW OF PHYTOPATHOLOGY" Volume 18 edited by Raymond G. Grogan, etc., iv & 533 pp., 4 b/w photo., 14 fig., 22 tab. & 1 map. Annual Reviews, Inc., Palo Alto, California 94306. 1980. \$20.00 in U.S.A., \$21.00 foreign.

This is another excellent collection of research and state of progress reports under such titles as: Biological Significance of Multicomponent Viruses, The Biology of *Striga*, *Orobanche* and Other Root-Parasitic Weeds, Lignification as a Mechanism of Disease Resistance, Systems Analysis in Epidemiology, Germplasm Resources of Plants. The interesting prefatory chapter is by the English genetical plant pathologist, Adrian Frank Posnette, and the historical perspectives survey the contributions of James G. Dickson, J. H. Craigie and Herbert Hice Whetzel. As always, this volume is thoroughly indexed.

"INTRODUCTION TO PLANT NEMATODES" by Victor H. Dropkin, xiii & 293 pp., 27 b/w tab., 88 photo., 110 fig. & 2 maps. Wiley Interscience Publication of John Wiley & Sons, Toronto,

Brisbane, Chichester and New York, N. Y. 10017. 1980. \$26.

"The phylum *Nematoda* is a large one, probably second only to insects in the diversity of species that it contains." The introduction surveys the whole field of nematology very interestingly; the beginning chapters discuss with excellent illustrations the structure and the function of nematodes generally and then those from a soil habitat. Then there is detailed identification of plant parasitic nematodes, their pathologies in various parts of the plant and their interactions with other organisms, nematode control and prospects for the future. This is a particularly well prepared "first" in the field.

"GENETICS OF HIGHER PLANTS - Applications of Cell Culture" by R. S. Chaleff, xiii & 184 pp., 19 b/w fig., 7 photo. & 15 tab., Cambridge University Press, Cambridge, CB2 1RP, England, & New York, N. Y. 10022. 1981. \$42.50.

This study for graduate students and researchers in this and kindred fields is No. 9 in the Developmental and Cell Biology Series. Like jewels and poison, it comes in a little package for a considerable price. Epigenetic control of gene activity (which persists indefinitely throughout cellular divisions even after removal of inducing conditions) may be induced by (1) selective RNA transcription from DNA, (2) RNA transport into the cytoplasm, (3) degradation of mRNA and (4) translation of mRNA into protein, consequently not all genes are expressed in the mature plant or in the cultural cell. The author predicts "exciting prospects for the genetic engineering of plants" by the introduction of purified DNA into cultured plant cells from anthers, etc.

"WILD TEAS, COFFEES & CORDIALS" by Hilary Stewart, 128 pp., 50 b/w draw. pl. & 9 photo., Douglas & McIntyre, Vancouver, University of Washington Press, Seattle, Washington 98105. 1981. \$7.95 paperbound.

This book seems to be a "first" for preparing pleasurable drinks from common wild plants of our Pacific Northwest. For 50 of them the left-hand page has a readily recognizable attractive plate drawing by the author and the opposing page provides the text on habitat, season, pretested preparation and tidbits of interest such as the early Amerinds, trappers and explorers uses.

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MIMOSA SOUSAE, A NEW SPECIES OF SENSITIVAE
(LEGUMINOSAE) FROM OAXACA, MEXICO.

Rosaura Grether
Depto. de Biología, División C.B.S.
Universidad Autónoma Metropolitana-Iztapalapa
México, D.F. Apdo. Post. 55-535

This species was collected as part of the study of Oaxacan Legumes, in which the author will contribute the taxonomic treatment of *Mimosa*.

The state of Oaxaca comprises very varied topographical and climatic conditions with a great diversity of species of *Mimosa* (45 species have been found in the state up to the present time). The following is a new species:

Mimosa sousae R. Grether, sp. nov.

Frutex vel suffrutex usque ad 1.5 m altus, inermis, omnis dense strigosus, trichomatibus barbellatis interdum basi ramosis. Pinnis unijugis, foliolis bigeminis, (1-) 2-4 (-7) cm longis, (1-) 1.5-2.5 (-4.5) cm latis, oblique ellipticis, obovatis vel orbicularibus usque ad oblongilanceolatis, utrinque ochraceis ob strigas confertas, apex obtusus usque ad mucronulatus vel acutus. Capitula axillaria solitaria vel 2-3 aggregata floribus hermaphroditis et masculinis, subglobosa circa 2 cm diametro, pedunculis 2.5-6 cm longis; calyx paleaceus corolla duplo brevior; corollae lobi ad apicem trichomatibus barbellatis; stamina tot quot corollae lobi vel duplo; ovarium stipitatum longe setosum. Legumen stipitatum 1-5 articulatum, valvae ochraceae dense strigosae, margine incrassato trichomatibus crassis brevibus, apex acutus usque ad rostratus aut mucronulatus usque ad mucronatus. Semina lenticularia brunnea usque ad rubella, plus minusve isodiametra.

Low shrub or suffrutescent plant, 0.3-1.5 m high, unarmed, with a densely strigous pubescence throughout, formed by barbellate, mostly single trichomes, sometimes branched at the base; branchlets, petioles and peduncles with single thin hairs intermixed with barbellate ones; branches terete, glabrate. Stipules 3-6 mm long, subulate to linear, rarely lanceolate; petioles terete, (1-) 2-2.5 (-7) cm long; pinnae 1 pair, (1-) 1.5-2 (-4) cm long; leaflets 2 pairs, (1-) 2-4 (-7) cm long, (1-) 1.5-2.5 (-4.5) cm wide, the lower inner one reduced, 0.4-1 cm long, 0.2-0.6 cm wide or absent, mostly obliquely elliptic or obovate, but frequently orbicular to oblong-lanceolate, ochre-yellow tonality given by the densely strigous pubescence on both

surfaces, margin thick with shorter trichomes, apex obtuse to mucronulate or acute. Inflorescences in axillary heads, solitary or in groups of 2-3, heads subglobose, ca. 2 cm in diameter (including stamens); peduncles 2.5-6 cm long; bracteoles linear-lanceolate, with a prominent midrib and barbellate trichomes, as long as or longer than the corolla. Flowers hermaphrodite or masculine and hermaphrodite in the same head; calyx paleaceous, 1.5-2 mm long, corolla 4-5 (-6)-lobed, lobes pink, 3-4 mm long, with barbellate trichomes at the apex; stamens as many as corolla-lobes or twice as many (rarely 11), filaments lilac, 11-12 mm long; pistil 13-15 mm long, ovary stipitate, 1-1.5 mm long, long setaceous; style glabrous, tapering toward the apex; stigma formed by a small opening. Legume mostly straight, sometimes curved, (2-) 3-5 (-6) cm long, (0.8-) 1 (-1.3) cm wide, 1-5 articles, stipe 0.2-1 cm long; valves densely strigous with barbellate trichomes swollen at the base, 2-3 mm long; margin thick, with shorter trichomes; apex acute to rostrate or mucronulate to mucronate. Seeds with a shining and smooth testa, brown to reddish, lenticular, rounded or slightly emarginate, isodiametric or slightly longer than wide, 5-6.6 mm long, 4.2-6.6 mm wide and 2-3 mm thick at the middle; pleurogram hippocrepiform; hilum elliptic; raphe a point.

The name of this new species honors M.C. Mario Sousa, coordinator of the study "Las Leguminosas del Estado de Oaxaca", who first collected it.

TYPE: MEXICO. Oaxaca: 2 km W of Salina Cruz, District of Tehuantepec. Sousa 9507, Sept. 19, 1978. HOLOTYPE: MEXU; ISOTYPES: to be distributed.

ADDITIONAL SPECIMENS EXAMINED: MEXICO. Oaxaca: 1-2 km W of Salina Cruz, Dto. Tehuantepec. R. Grether 1232 and H. Quero, Dec. 14, 1978 (MEXU, UAM-I); same locality, Sousa 7423, Jun. 19, 1977 (MEXU, UAM-I); same locality, Sousa 8633, Oct. 27, 1977 (MEXU, UAM-I); same locality, Sousa 9109, Feb. 20, 1978 (MEXU, UAM-I); same locality, Sousa 10120, Dec. 15, 1978 (MEXU, UAM-I).

This new species is included in the Series *Sensitivae*, characterized by the presence of one pair of pinnae and two pairs of large leaflets on each rachis, the lower inner one reduced or absent; *Mimosa sousae* is distinguished from other species of *Sensitivae* by very abundant barbellate trichomes giving an ochre-yellow tonality to the leaflets and fruits, by the long peduncles, by the large flowers and large subglobose heads.

Its distribution is apparently very restricted; up to the present time, it has been found only on hills locat



Mimosa sousae. a) Flowering branch. b) Portion of leaflet, note the barbellate trichomes. c) Fruiting branch. d) Portion of fruit showing the very densely strigous pubescence and thick margin with shorter barbellate trichomes. e) Flower and bracteole. f) Pistil.

ed in the vicinity of Salina Cruz, at 20-100 m of altitude, on very rocky hillsides with a shallow igneous soil, over looking the Pacific Ocean, very close to the coast on an area exposed to very strong winds. This shrub attains only 40 cm high when growing on places directly exposed to the wind. In dells and protected places, however, it can attain 1.5 m. This species blooms in June; mature fruits can be found from September through February of the following year.

The characteristic vegetation on those hills is an Arid Tropical Scrub with *Dodonaea viscosa* Jacq., *Comocladia* sp., *Krameria grayi* Rose, *Russelia sarmentosa* Jacq. and different legumes, such as:

<i>Aeschynomene acapulcensis</i> Rose	<i>Lonchocarpus emarginatus</i> Pitt.
<i>Aeschynomene pinetorum</i> Brandg.	<i>Mimosa deamii</i> Rob.
<i>Calliandra purpusii</i> Brandg.	<i>Mimosa goldmanii</i> Rob.
<i>Cassia flexuosa</i> L.	<i>Nissolia pringlei</i> Rose
<i>Cassia serpens</i> L.	<i>Phaseolus microcarpus</i> Mart.
<i>Crotalaria pumila</i> Ort.	<i>Pithecellobium platylobum</i> (Spreng.) Urb.
<i>Desmodium glabrum</i> (Mill.) DC	<i>Pityrocarpa flava</i> (Spreng. ex DC) Brenan
<i>Galactia striata</i> (Jacq.) Urb.	<i>Stylosanthes aff. viscosa</i> Sw.

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I wish to express my appreciation to Dr. R. S. Cowan of the Department of Botany, Smithsonian Institution for his suggestions, to Dr. F. Chiang of the Department of Botany, Instituto de Biología, UNAM and to Dr. J. Rzedowski of the Department of Botany, ENCB, IPN for their assistance and critically reviewing the manuscript.

LANGERMANNIA BICOLOR (LEV.) DEMOULIN & DRING

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SUMMARY

American specimens identified as Lanopila bicolor and Lanopila wahlbergii are compared with material from Africa and with the isotype of Bovista bicolor Lev. from India. It was found that they belong to the same species.

In the process of this study, the cells called mycoscle-reids by Homrich and Wright (1973), were found and interpreted following the opinion of Dr. R. Singer, as chlamy-dospores.

Langermannia bicolor has in tropical America a very wide and irregular distribution ranging from Mexico and the West Indies to Argentina with northern and southern limits reaching the warm-temperate zones. Lately it has been collected in the southwestern part of the United States and southern Florida.

The first material of this species was collected in India and identified by Leveille (1846) as Bovista bicolor. This material has been missing for a long time (seen last by Lloyd in Paris in 1902), only one isotype is in Berkeley's collection at Kew. This specimen must be considered as the lectotype of Langermannia bicolor.

Years later Fries (1849) created the genus Lanopila based on material collected in Natal, South Africa by Wahlberg and named it Lanopila wahlbergii but the type material of this species is missing also.

Later Reichardt (1870) proposed the name Lasiosphaera fenzlii for a specimen from Nicobar Island in India. This name was recognized by Hollos (1904) and Smarda (1958) and Dissing and Lange (1962) identified material collected by Vanderist and Gossens-Fontana in Congo as Langermannia fenzlii (Reich.) Kreisel but Demoulin and Dring (1975) studied the type material of Lasiosphaera fenzlii Reich from Nicobar Island and stated that the spores and capillitium are similar to the African material of Langermannia wahlbergii (Fr.) Dring.

Patouillard (1899) named some material from South America Lanopila bicolor considering that it agrees with Bovista bicolor of Leveille from India and has been known in America as L. bicolor or L. wahlbergii. There have always been doubts about the taxonomic position of the American material and of its identity with the material collected in Africa as Lanopila wahlbergii and in Asia as Lasiosphaera fenzlii and Bovista bicolor.

Spegazzini (1881-1891) identified two species from Argentina and Lanopila argentina and Lanopila guaranitica which are now considered synonymous with Langermannia bicolor.

Lloyd (1904) after seeing the material of Leveille from India (Bovista bicolor Lev.) in Paris, was the first to call attention to the similarity of the materials from America, Africa and Asia and called them Lanopila bicolor. In 1923 he returned to the name Lanopila wahlbergii and named two new species, L. capensis from South Africa and L. yuconensis from Canada. The last two species are included in the list of Species Excludendae.

R. E. Fries (1909) recognized Lanopila bicolor (Lev.) Pat. and created a new species, L. pigmaea from Bolivia, which is a Bovista.

Verwoerd (1925) recognized Lanopila wahlbergii, Lanopila capensis and named a new species Lanopila radloffiana. The last is included in the list of Species Excludendae.

Swoboda (1937) made an extensive anatomical study of some specimens from Texas which he called Lanopila wahlbergii Fries. He claims that this material was so identified by Alexander H. Smith. It is however another fungus, as Dr. Smith clarified in a personal communication to Homrich and Wright (1973).

Dring (1964) proposed to include Lanopila and Lasiosphaera in the old genus Langermannia, recognizing two species, L. gigantea from the temperate zones, as the type, and L. wahlbergii from Africa. He considers that all the material collected in Africa, belong to the Frie's species since even in the original description the spores are not described as spinose.

Kreisel (1962) recognized Langermannia fenzlii (Reich.) Kreisel as a nov. comb. based on Lasiosphaera fenzlii Reich. but in 1967 in the discussion of the Calvatia-Complex he included Lanopila and Lasiosphaera in the genus Langermannia, with the following species L. wahlbergii (Fr.) Dring, L. pachyderma (Peck) Kreisel and L. gigantea (Batsch ex Pers.) Rostk. Langermannia pachyderma is here included in Species Excludendae as Gastropila fragilis (Lev.) Homrich and Wright.

Eckblad (1971) considers the spores of Lanopila bicolor to be fairly close to those of the group of Bovista, Calvatia, Disciseda and Lycoperdon.

Homrich and Wright (1973) after making an intensive study of the peridium of American material, which they called Lanopila bicolor, retaining the generic name Lanopila instead of Langermannia "until more conclusive evidence is presented that their (respective) type species are congeneric." These authors stated that Lanopila is monotypic and belongs in the Lycoperdales, and maintain that the differences observed by others between Lanopila bicolor from

America and Asia and *Lanopila wahlbergii* from Africa, are in the range of "specific variation."

Studying material referred to *Lanopila* from America, Africa and Asia and comparing it with the isotype of *Lanopila bicolor* (Lev.) Pat. (*Bovista bicolor* Lev.) from India at Kew, I found that in the material with the epithets, *bicolor*, *wahlbergii* and *fenzlii*, the exoperidium is formed of two or more layers of appressed irregularly polygonal cells (as epithelial cells) 3 x 4 u in diameter, light brown or yellowish. Underneath the exoperidium I found that some of the cells called mycosclereids .) by Homrich and Wright (1973). When consulted, Dr. Singer stated that they are chlamydospores, comparable to those present in *Squamanita schreieri* (Imbach) Imbach as demonstrated by Singer and Clemençon (1972). These cells are round 12 x 15 u in diameter, smooth and with a cyanophilous wall. The endoperidium is formed of large brown ramified sterile filaments that form a layer easily separated from the rest of the gleba. The basidiospores are round with verrucose protuberances, dark-yellow, approximately 6 u in diameter (including ornamentation). The capillitium is ramified and septate and separating at the septa. Filaments 4 u in diameter, brown with round pores.

Treated with Melzer solution the exoperidial cells were separated from each other but no color change was produced; nor were the spores, capillitium and chlamydospores affected by this treatment (inamyloid).

NH₄OH did not produce any change in the aspect of the exoperidium, capillitium or spores.

With cotton blue the cells of the exoperidium were freed and absorbed the blue color (cyanophilous reaction). Spores and capillitium were acyanophilous. The chlamydospores were strongly cyanophilous in the periphery and with a cyanophilous inner wall.

The exoperidium of these species is similar to the exoperidium of *Langermannia gigantea* (material from Wisconsin, (F)).

The spores which are very rugose, verrucose as previously stated in *Langermannia bicolor* and *Langermannia wahlbergii* are almost smooth in *Langermannia gigantea*.

Following the opinion of Dring (1964) I adopt the generic name *Langermannia* for the species known as *Lanopila bicolor* in America.

The specific name *bicolor* used by Leveille in 1846 (*Bovista bicolor* Lev.) for the material collected by Polydore Roux in Bombay, India is the oldest name used for this species and will

.) Our interpretation of these "Mycosclereids" in the sense of Homrich and Wright does not affect the original definition and illustration of mycosclereids in *Tulostoma* (Wright 1955).

take precedence over wahlbergii, the name used by R. M. Fries in 1849 for the material collected by Wahlberg in Natal, South Africa and fenzlii, the name used by Reichardt in 1870 for the material from Nicobar, Island, India.

After comparing the isotype material of Bovista bicolor Lev. from India (K) with the material from America and Africa I arrived at the conclusion that all belong to the same species. Since the type of Lanopila wahlbergii Fries is missing I used for comparison with American and African material the specimen from Durban, South Africa collected by P. van der Bijl and identified by Lloyd as Lanopila wahlbergii, Lloyd #354, Lloyd Cat. 53094. There is an annotation by Zeller as L. bicolor.

All the other species identified as Lanopila or Lasiosphaera except the type Lasiosphaera (Pers.) Smarda (= Langermannia gigantea (Pers.) Rostk.) are synonyms of Langermannia bicolor or belong to other genera such as Calvatia, Bovista, Lycoperdon, etc.

I agree therefore with Demoulin & Dring (1975) who, with reservation, proposed to adopt the name Langermannia bicolor (Lev.) Demoulin & Dring for the material collected in India. Since I am convinced that the African and American material are conspecific Langermannia bicolor is then the correct binomial to be used for all materials described below.

LANGERMANNIA BICOLOR (Lev.) DEMOULIN & DRING

Bovista bicolor Leveille, Champignon du Museum de Paris. Ann. Sci. Nat. Bot. Ser. 3(5): 162. 1846.

Lanopila wahlbergii Fries, Fungi Natalensis. Kongl. Vetensk. Acad. Handl. 1848. 15. 1848.

Lasiosphaera fenzlii Reichardt in Reise seiner Majestat Fregatte Novara um die Erde 1: 135. 1870.

Lanopila argentina Spegazzini. Fungi Argentini. Anales Soc. Ci. Argent. 12: 248. 1881.

Lanopila guaranítica Spegazzini. Fungi Guaranitici Nonnulli Novi Vel Critici. Revista Argen. Hist. Nat. 1(3): 169. 1891.

Lanopila bicolor (Lev.) Patouillard. Champignons de la Guadalupe. Bull. Soc. Myc. Fr. 15: 203. 1899.

Langermannia wahlbergii (Fr.) Dring. Gasteromycetes of West Tropical Africa. C. M. I. Mycol. Papers No. 98: 46. 1964.

Basidiocarps globose to depressed-globose, 3-10 cm in diameter, without a basal rhizomorph, pinched into a basal point of attachment from which it breaks away at maturity. Peridium formed by three layers, the outer two apparently forming the exoperidium, which is very thin, smooth and sometimes brilliant, formed by periclinally disposed hyphae, easily falling off in flakes at first orange pinkish turning to brown when mature and dry; the endoperidium 20-30 μ thick, elastic, smooth, almost chamois-like to the touch, light cinnamon, remaining after most of the exoperi-

dium has fallen off but afterwards also breaking off in patches and eventually disappearing. On the upper limit of the endoperidium there are some round cells of 12-15 μ in diameter with an intense cyanophilous wall interpreted as chlamydospores (mycoscleroids of Homrich and Wright (1973). Gleba light brown, formed by the capitial threads intertwined plus the spores, and appearing as a compact, very persistent mass of wool. Subgleba absent. Spores globose, light brown, some with a short pedicel, closely warted, 5.5-7.5 μ in diameter, including the ornamentation; the warts arise from a thick wall. (Eckblad (1971) has shown with SEM that the spores are covered by high warts like cylindric cogs arranged in groups and with a flattened apex). Capillitium composed of densely interwoven, light brown 3-4 μ in diameter, sparsely branched hyphae, with all the branches of equal diameter but the ends of the threads distinctly tapering, easily isolated, narrower at the frequent septa wall with round pore-like perforation.

Type collection. Polydore Roux, (isotype Herb. Berkeley (K) Bombay, India.

Habitat: On the ground, in open and shaded sites or in sand dunes along the seashore, with scant vegetation; free at maturity.

Distribution: Africa, south of the Sahara; tropical Asia; South America; West Indies; Southern North America.

CENTRAL AMERICA. MEXICO. Chihuahua, Sanderson 5408, 1954, Lloyd Cat. 53085 as *Lanopila bicolor* (BPI). NICARAGUA. No other information, Smith s.n. ex Ellis collection as *Lanopila rubra*, *Bovista laterita* Berk. and *Lycoperdon rubrum* (NYBG); Smith 235 as *Bovista laterita* Berk. (NYBG). WEST INDIES. INDES. No other information. No collector. Herb. Patouillard as *Lanopila bicolor* (Lev.) (FH). CUBA. Wright 925 *Fungi cubenses Wrightianii* as *Bovista tosta* B & C. (FH). JAMAICA. Kingston; Hope Garden, Harris s.n. 3-13-1910, Lloyd 07015 and Lloyd Cat. 53807, as *Lanopila bicolor* (BPI) (NYBG). PUERTO RICO. San Juan, Earle 73 as *Lycoperdon* sp. (NYBG). GUADALUPE. Base Terre, Duss 92, Herb. Patouillard as *Lanopila bicolor* (Lev.) (Pat. and *Lycoperdon* (BPI). ST. KITTS. Lunt s.n., Herb. Patouillard as *Lanopila bicolor* (Lev.) Pat. Lloyd 03175 (FH) (NYBG), Lloyd Cat. 53089 and 30989 (BPI). MONSERRAT. Plymouth, Shaffer 873, as *Bovista* sp. (NYBG). SOUTH AMERICA. No other information. Lloyd 6343, Herb. Patouillard as *Lanopila bicolor* (Lev.) Pat. (FH). VENEZUELA. No other information, Lewis s.n. (by Squibb Institute) as *Lanopila wahlbergii* R. E. Fries (NYGB); Guarico, Calabozo. Estacion Biologica Llanos, Tamayo 4316 as *Lanopila bicolor* (Lev.) Pat. (BPI). ECUADOR. Pichincha: San Nicolas, Lagerheim s.n. Lloyd 6343, Lloyd Cat. 30988 as *Lanopila bicolor* (FH); Quito, Mille s.n. Feb. 1919, Lloyd Cat. 50578, as *Lanopila wahlbergii*, is *Bovista plumbea* Pers. ex Pers. (BPI). BRAZIL. No other information. Rick s.n. Lloyd 03676, Lloyd Cat. 53092 as *Lanopila bicolor* (BPI); Rick s.n. Lloyd Cat. 53090 as *Lanopila bicolor* (BPI); Rick s.n. Lloyd 04020, Lloyd Cat. 53091 as *Lanopila bicolor* (BPI); Rick s.n. Lloyd 06233, Lloyd Cat. 53093 as *Lanopila guaranitica* ? (Note of Zeller as *Lanopila bicolor* (BPI); Bahia: Torrend s.n. Lloyd 726, Lloyd Cat. 14658 as

Lanopila wahlbergii (BPI): Rio Grande Sul: Sao Leopoldo, Rick s.n. 1931 (FH). PARAGUAY. No other information. Balanza s.n. Herb. Patouillard as Lanopila guaranitica Speg. (FH). NORTH AMERICA. UNITED STATES. Arizona: 7 miles North of Nogales, Long and Samberg s.n. Nov. 13, 1936, W. H. Long Herb (BPI); Santa Cruz River 10 miles from Nogales Long 8253, June 4, 1938, W. H. Long Herb. (BPI) (NYBG); Santa Cruz River 8 miles from Nogales, Long 8254, Nov. 10, 1938, W. H. Long Herb. (BPI); Florida: Southern Florida (in citrus grove), Weber and West s.n. Dec. 1949, as Bovista bicolor (Lev.) Pat. (BPI). AFRICA. ZAIRE (Belgian Congo). Kawai: Sankuru (Lusambo) Free State, Luja s.n. Jan. 1908, Lloyd Cat. 30990 as Lanopila bicolor (BPI). TANZANIA (Dutch Africa) Tanganyca, Amani, Braum 1949 Feb. 16, 1908, Lloyd Cat. 53080 as Lanopila bicolor. It is a mixed collection with Lycoperdon sp.. SOUTH AFRICA. No other locality, Duthie s.n. no date, Lloyd Cat. 19248 as Lanopila wahlbergii (BPI); Durban, Bijl s.n. 1919 ?, Lloyd Cat. 53094 as Lanopila wahlbergii. There is an annotation by Zeller as L. bicolor (BPI). ASIA. INDIA. Bombay: Polydore Roux s.n. No date of collection, Herb. Berkeley. Annotated "from the type locality," Isotype (K).

SPECIES EXCLUDENDAE

- Lanopila capensis Lloyd, Myc. Wright 7: 1177. 1923. Typus: Duthie 403, Lloyd Coll. No. 7567 (BPI). Locus typicus: Union of South Africa.
- Lanopila pygmaea R. E. Fries, Ark. Bot. 8 No. 11: 16-17. Tab. II. 6-9. 1909. Typus: Cotypus R. E. Fries 65a, Lloyd Coll. No. 32435. Locus typicus: Pampa Blanca, Jujuy, Argentina. It is Bovista pusilla (Batsch ex) Pers.
- Lanopila radloffiana Verwoerd, Annale Universiteit Stellenbosch 3: 25. 1925. Typus: Radloff (V. D. Byl 1439) (STE). Locus typicus: Winburg, O. V. S. Union of South Africa. It is Bovista.
- Lanopila stuppea (Berk.) De Toni in Saccardo Sylloge Fungorum 7: 95. 1888. Typus: Wright s.n. (Bovista stuppea Berk. North Amer. Fungi No. 330). (K). Locus typicus: Texas, U.S.A. It is Bovistella radicata (Dur. & Mont.) Pat.
- Lanopila tabacina (Sacc.) de Toni Saccardo Sylloge Fungorum 7: 95. 1888. Typus: Missing. Locus typicus: Canada. It is Bovista pila Berk. & Curt, cf. Lloyd Myc. Writ.: 117. 1902.
- Lanopila yuconensis Lloyd, Myc. Writ. 7: 1177. 1923. Typus: Sterling s.n. Lloyd Coll. No. 7566. (BPI). Locus typicus: Dawson, Yukon Terr. Canada. It is Bovista pusilla (Batsch ex) Persoon.
- Langermannia pachyderma (Peck) Kreisel, Die Lycoperdaceae der Deutschen Demokratischen Republik. Bibliotheca Mycologica Band 36: 120. 1962. as nov. comb. based on Lycoperdon pachyderma Peck. Bot. Gazette 7: 54. 1882. It is Gastropila fragilis (Lev.) Homrich & Wright.

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FIG.1. *Langermannia bicolor* (Polydore Roux s n, isotype K): a, spore 8,000 X. b. capillitium and spores 800 X. c, basidiocarp 3/4 natural size.



FIG.2. *Langermannia bicolor*, a-c (Lunt s n, Lloyd Cat. 30989 BPI): a, chlamydospore 1,800 X. b, spore 8,000 X. c, capillitium and spores 800 X. d,e (Bijl s n, Lloyd Cat. 53094 BPI): d, capillitium and spores 800 X. e, spore 8,000 X.

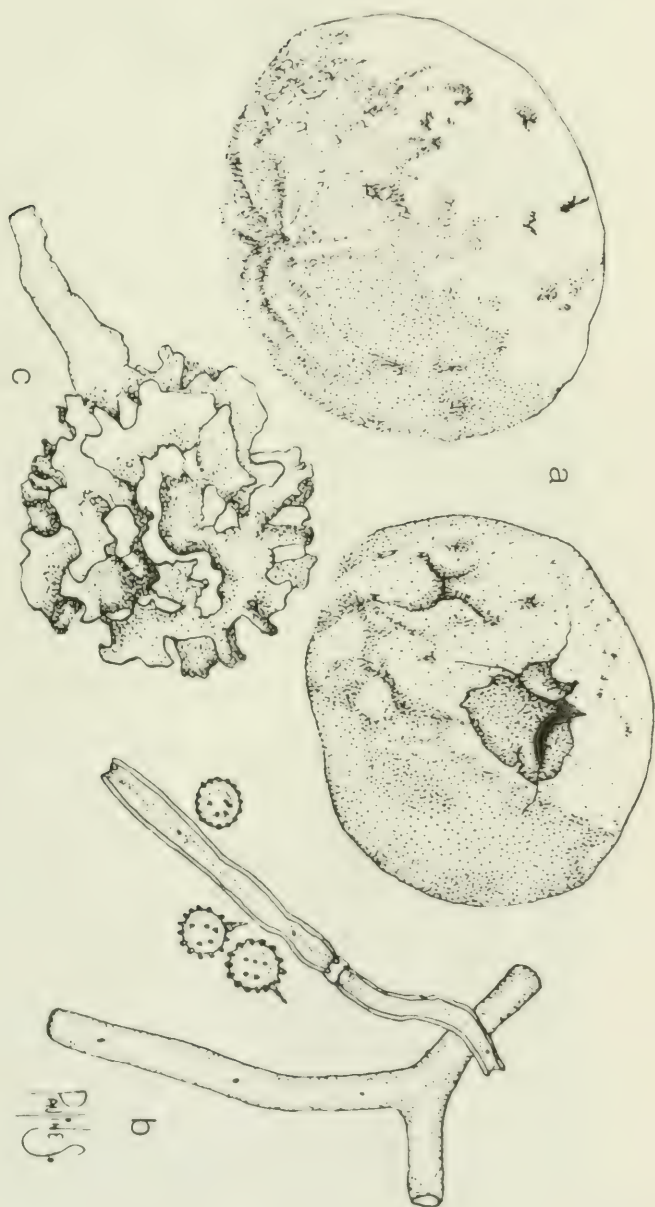


FIG. 3. *Langermannia bicolor*, a, b (Bill s n, Lloyd Cat. 53094 BPI): a, basidiocarp 3/4 natural size. b, capillitium and spores 1,000 X. c (Rick s n, Lloyd Cat. 53091 BPI): spore 8,000 X.

ADDITIONAL NOTES ON THE GENUS *HOLMSKIOLDIA* (VERBENACEAE). I

Harold N. Moldenke

HOLMSKIOLDIA Retz.

Additional and emended bibliography: Baill., Hist. Pl. 11: 86--87, 112, & 113, fig. 97. 1891; Mold., Phytologia 48: 313--356. 1981.

HOLMSKIOLDIA TETTENSIS (Klotzsch) Vatke

Additional bibliography: Mold., Phytologia 48: 322, 323, & 354--356. 1981.

This species is reported by Compton (1966) from the poorts in Swaziland and by Riley (1963) as cultivated in South Africa. Baker (1900) cites unnumbered Kirk and Peters specimens from Mozambique and another unnumbered Kirk specimen from Nyasaland. Van der Schijff (1969) cites his *nos.* 1043 & 2776 and *Lam* 13 from Kruger National Park.

Common and vernacular names reported for the species are "China hat plant", "Chinese hat plant", "cups and saucers", "cups-and-saucers", "lavender cup-and-saucer plant", "parasol flower", and "the crackler".

Codd 3254 has the fruiting-calyxes hardly lobed, while of *Codd* 2932 Meeuse, in a personal communication to me, says: "this specimen was collected near the Zululand border and quite a distance from the type locality of *H. tettensis* which is from near the Zambezi river. In this specimen the calyx is hardly lobed to rather distinctly lobed, and the leaves are not very hairy and glandular."

The Foster collection cited below is from a plant cultivated in Natal, but originally from Transvaal.

Citations: MOZAMBIQUE: Lourenço Marques: *Balsinhas* 165 (U1); *Barbosa* 737 (Ld, U1); *Exell, Mondonça, & Wild* 471 (U1); *Gomes e Sousa* 3665 (U1); *Hornby* 972 (U1), 2661 (Ld, N); *F. A. Mendonça* 1658 (U1), 2964 (U1), 4523 (U1); *Torre* 1849 (U1), 6489 (U1), 6839 (U1). Moçambique: *Borle* 152 (N, N--photo, S, Si--photo, V--1083, Z--photo), 276 [Nat. Herb. Pretoria 3010] (Ba). Sul do Savo: *Codd* 2932 (Ss). SWAZILAND: *Compton* 28619 (Mu), 30396 (Mu). SOUTH AFRICA: Natal: *D. Edwards* 2944 (Mu); *Strey* 6556 (Mu). Transvaal: *Acocks* 12914 (Le); *Bayliss* 10602 (Mu); *Codd* 3254 (Ss); *Meeuse* 10643 (Mu); *Pole-Evans* H.16879 (N, Ss), *s.n.* [Lebombo Mts., 9.1.29] (Z); *Schlieben & Strey* 8391 (Mu); *Van Wyk* 404 (Ac). CULTIVATED: Florida: *Gillis* 11046 [M.20265] (Ld). Hawaiian Islands: *H. N. Moldenke* 21855 (Mi); *Neal s.n.* [July 30, 1946] (Bi); *G. Price s.n.* [July 23, 1951] (Bi); *Tong s.n.* [Sept. 12, 1946] (N). Natal: *H. M. L. Forbes s.n.* [January 1931] (Ms), *s.n.* [March 1936] (F--photo, Gg--267596, N, N--photo, Si--photo, Z--photo). Zimbabwe: *A. L. Shepherd s.n.* [Govt. Herb. Salisbury 30948] (N).

HOLMSKIOLDIA TETTENSIS f. *ALBA* Mold., Bol. Soc. Brot., ser. 2, 40: 123. 1966.

Bibliography: Mold., Bol. Soc. Brot., ser. 2, 40: 123. 1966; Mold., Résumé Suppl. 13: 4. 1966; Anon., Assoc. Etud. Tax. Fl. Afr. Trop. Ind. 1967: 62. 1968; Anon., Biol. Abstr. 49: 390. 1968; Mold., Fifth Summ. 1: 251 (1971) and 2: 881. 1971; Mold., Phytol. Mem. 2: 241 & 550. 1980; Mold., Phytologia 48: 323. 1981.

This form differs from the typical form of the species in having white flowers.

It is based on a collection made by Antonio Rocha da Torre (no. 2015) near Goba, Maputo, Lourenço Marques, Mozambique, on November 15, 1940, deposited in the herbarium of the Centro de Botânica, Junta de Investigações do Ultramar. in Lisbon. Thus far the form is known only from the type collection.

Citations: MOZAMBIQUE: Lourenço Marques: Torre 2015 (Ul--type).

HOLMSKIOLDIA TETTENSIS f. *FLAVA* Mold., Phytologia 48: 323, nom. nud. 1981; f. nov.

Bibliography: Mold., Phytologia 48: 323. 1981.

Haec forma a forma typica speciei calycibus flavis recedit.

This form differs from the typical form of the species in having its mature calyxes [and probably also the corollas] yellow.

It is based on *Strey 4000* from stony mountain slopes in the Berberton District of Transvaal, South Africa, about 5 miles south of Komatipoort, collected on March 15, 1962, and deposited in the Munich herbarium. The collector notes that the plant was 4--5 feet tall and calls attention to the marginally crenate leaf-blades. Thus far the form is known to me only from the original collection.

Citations: SOUTH AFRICA: Transvaal: *Strey 4000* (Mu--type).

HOLMSKIOLDIA sp. nov. ined.

Bibliography: Mold., Phytol. Mem. 2: 230 & 550. 1980; Mold., Phytologia 48: 323. 1981.

There is what appears to be a new and undescribed species of this genus in Kenya, represented by *Faden*, *Faden*, *Gillett*, & *Gachathi* 77/439 in my personal herbarium and in the East African Herbarium at Nairobi. It is said to be a tree, 12 m. tall, with a narrow crown, the bark tan-colored, peeling, with permanent lenticels, the leaves opposite, oblong, about 30 cm. long, 15 cm. wide, glabrous, with a dense reticulate venation. It grows on limestone rodes along with *Commiphora zimmermannii*, *Erythrina saculeuxii*, *Ficus* sp., *Gyrocarpus americana*, *Sterculia appendiculata*, *Ricinodendron*, etc. and was actually collected at K.7, Kilifi District, just north of Mwara Kenya on the Chonyi to Ribe road, 4.8 km. south of the turn-off on the Kilifi to Kaloleni Road, at 3°47' S., 39°42' E., at an altitude of about 140 m., on February 16, 1977. The mature calyx is pink, papery, rotate-patelliform, 6 cm. wide, marginally very shallowly 5-lobed, prominently venose. The collectors note "One tree and one sapling only". Attempts by Dr. Gillett to secure flowering material have thus far proved unsuccessful.

NOTES ON THE GENUS *ARCHBOLDIA* (VERBENACEAE)

Harold N. Moldenke

Although time does not permit the preparation of the detailed monograph of this genus originally planned and announced, it is probably worthwhile to place on record here the bibliographic and herbarium notes assembled by my wife, Alma L. Moldenke, and myself since the work on this family of plants was begun by me in 1929. This is the 64th genus so far treated in this series of papers and the herbarium acronyms employed are the same as used in all previous papers in this (and some other) journals and are fully explained most recently in *Phytologia Memoirs* 2: 463--469 (1980) as well as in many of the earlier papers.

ARCHBOLDIA Beer & Lam, *Blumea* 2: [31]. 1936.

Bibliography: Beer & Lam, *Blumea* 2: [31]--33 & 221. 1936; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 67 & 86. 1942; Hill & Salisb., *Ind. Kew. Suppl.* 10: 18 & 251. 1947; H. N. & A.L. Mold., *Pl. Life* 2: 34 & 49. 1948; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 148 & 176. 1949; Angely, *Cat. Estat. Gen. Bot. Fan.* 17: 3. 1956; Anon., *U. S. Dept. Agr. Bot. Subj. Ind.* 14353. 1958; Mold., *Résumé* 200, 408, & 442. 1959; F. A. Barkley, *List Ord. Fam. Anthoph.* 76 & 141. 1965; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 7, 85. 1966; Rouleau, *Guide Ind. Kew.* 17 & 352. 1970; Mold., *Fifth Summ.* 1: 334 (1971) and 2: 756 & 850. 1971; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 8, 88. 1973; Mold., *Phytol. Mem.* 2: 325 & 524. 1980.

Shrubs; leaves simple, decussate-opposite, exstipulate, petio- late; inflorescence terminal, cymose, determinate, centrifugal, the cymes aggregate in corymbose panicles; calyx gamosepalous, inferior, infundibular, slightly zygomorphic, more or less spreading, 5-lobed; corolla gamopetalous, exserted, actinomorph- ic, the tube ventricose-cylindric, the limb 5-lobed; stamens 4, inserted slightly below the mouth of the corolla-tube, completely included, in 2 equal pairs, all fertile; filaments short, fili- form; anthers dorsifixed, introrse; pistil single, compound, bi- carpellary, scarcely exserted; stigma subulate; ovary superior, compound, bicarpellary, imperfectly 4-celled, each cell 1-ovulate, the ovules anatropous, attached to basally parietal inflexed placentae; fruit drupaceous, red when immature.

Type species: *Archboldia ericoides* Beer & Lam.

This is apparently a monotypic genus endemic to New Guinea. Beer & Lam (1936) say of it: "Though the material is very scanty and not very well preserved, we may suppose with some probability that this is the representative of a new genus. It cannot be com- bined with any Verbenaceous genus thusfar known from Malaysia, New Guinea, Australia or Polynesia, being particularly distinguished by its peculiarly glabrous, inflate[d] and actinomorphous corolla and its mododynamous [sic; =monodynamous?] and very short stamens.

These features remind [one] somewhat of certain *Ericaceae*, hence the specific name, chosen for the only species known at the [this] time. As the ripe fruit and seed are unknown, it is difficult to say something definite on the taxonomic relations of the genus. It could possibly be placed in the subsection *Chloanthoideae-Physopsidae*, which is entirely of Australian distribution; however, *Archboldia* misses the woolly tomentum which is so characteristic of this group [now known as the *Chloanthaceae*] and the general habit reminds one strongly of *Faradaya* (*Viticoideae-Clerodendreae*). I would provisionally consider it as an ally to the last-named group."

It is named in honor of Richard Archbold (1907--), contemporary American explorer in Madagascar and leader of several expeditions to New Guinea.

By the term "monodynamous" in the description of this genus, the authors apparently mean to say "in two equal pairs", which, in my opinion, would be a more easily understood description.

ARCHBOLDIA ERICOIDES Beer & Lam, *Blumea* 2: [31]--33. 1936.

Bibliography: see bibliography of the genus as a whole (above).

A glabrous or subglabrous shrub, about 1 m. tall; branches erect, arising from an enlarged rootstock; branchlets subtetragonal, purple; leaves decussate-opposite; petioles 1--2 cm. long, purple, glabrous; leaf-blades papyraceous, ovate, 14--17 cm. long, 7--8 cm. wide, apically obtusely acuminate, marginally entire, basally broadly acute, glabrous above, minutely and sparsely pubescent beneath; midrib scarcely prominulous above in drying, conspicuously prominent and purple beneath; secondaries 5--7, distant, the basal ones opposite, straight, and ascending to about the middle of the blade, the others curvate-ascending, all distinctly prominulous; tertiaries transverse, the smallest ones reticulate, conspicuous beneath; inflorescence terminal, basally leafy, broadly corymbose, 6--8 cm. long and wide, very minutely pubescent or subglabrous; peduncles short; cymes few-flowered, decussate bracts caducous; flowers rather large; pedicels 1--2 mm. long, sparsely and minutely appressed-pubescent; calyx 6--7 mm. long, externally minutely appressed-pilose, internally glabrous, covered with minute tawny to golden glands, the lobes deltoid, about 3 mm. long, apically acute; corolla somewhat fleshy, about 2 cm. long, glabrous on both surfaces, the tube rather inflated, 7--8 mm. in diameter, the lobes about 4 mm. long, apically obtuse; stamens glabrous, the filaments and anthers together about 1.5--2 mm. long; style short, glabrous; ovary minute, glabrous; very immature fruit red.

This species, type species of the genus, is based on *L. J. Brass* 6025 from the edge of a small swamp in a savanna forest at Wuroi, on the Oriomo river, Western Division, Papua, New Guinea, collected between January and March 1934 and deposited in the Leiden herbarium. The species is thus far known only from the type collection.

Citations: NEW GUINEA: Papua: *Brass* 6025 (Le--936238-243--type, N--isotype, N--photo of type, Z--photo of type).

NOTES ON THE GENUS *HUXLEYA* (VERBENACEAE)

Harold N. Moldenke

Lack of time this late in life prevents preparation of the detailed monograph of this genus as originally planned and announced, but it has been considered advisable to place on record here the bibliographic notes assembled by my wife, Alma L. Moldenke, and myself since the work on this family of plants was initiated in 1929. This is the 65th genus so treated by us in this extensive series of papers in this (and some other) journals.

HUXLEYA Ewart, Proc. Roy. Soc. Victoria, ser. 2, 25: 109, pl. 5. 1912.

Bibliography: Ewart & Rees, Proc. Roy. Soc. Victoria, ser. 2, 25: 109--[111], pl. 5. 1912; Wangerin, Justs Bot. Jahresber. 40 (1): 862. 1914; Prain, Ind. Kew. Suppl. 5, imp. 1, 137. 1921; Fedde & Schust., Justs Bot. Jahresber. 43: 158 & 159. 1922; Junell, Symb. Bot. Upsal. 1 (4): 111--112 & 203. 1934; Mold., Alph. List Inv. Names 27. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 69 & 93. 1942; H. N. & A. L. Mold., Pl. Life 2: 34 & 65. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 153 & 186. 1949; Mold., Résumé 209, 301, 411, & 457. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 137. 1960; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 174. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 461. 1966; L. S. Sm., Contrib. Queensl. Herb. 6: 20. 1969; Rouleau, Guide Ind. Kew. 95 & 352. 1970; Mold., Fifth Summ. 1: 346 (1971) and 2: 531, 760, & 881. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 575. 1973; Mold., Phytol. Mem. 3: 337 & 550. 1981.

Erect herbaceous plants; leaves simple, elongate-linear or filiform, opposite or alternate, exstipulate; flowers rather large, solitary, axillary, without bracteoles, complete, perfect; calyx gamosepalous, inferior, campanulate, deeply 5-cleft; corolla gamopetalous, hypocrateriform, the tube narrow-cylindric, elongate, about equal in width throughout, the limb spreading, 5-cleft; stamens 4, inserted in the corolla-tube and exerted from it, isometrous, all fertile; anthers bilocular, each theca dehiscing longitudinally; pistil single, apparently 1-carpellary by reduction; style elongate; stigma terminal, slightly bifid; ovary superior, 2-celled, apically distinctly 2- or 4-lobed, each cell containing one anatropous ovule laterally attached near the base.

Type species: *Huxleya linifolia* Ewart & Rees.

This apparently monotypic genus of northern Australia is named in honor of Thomas Henry Huxley (1825--1895), famous English naturalist and author, friend and champion of Charles Darwin.

According to Ewart & Rees (1912) this "genus differs from *Faradaya*, the only other Australian genus of this sub-order, in having the calyx 5-lobed (instead of 2), 5-lobed corolla (instead of 4), equal stamens (not didynamous), ovary 2-celled (not 4), in being an

upright herb (not a woody climber), in the flowers solitary (instead of in terminal panicles). These distinctions are almost sufficient to make an additional sub-tribe" in the tribe *Viticeae* of the family *Verbenaceae*. In fact, these authors actually do propose a subtribe *Oxereae*. The genus is presently classified in tribe *Clerodendreae*.

HUXLEYA LINIFOLIA Ewart & Rees, Proc. Roy. Soc. Victoria, ser. 2, 25: 109, pl. 5. 1912.

Synonymy: *Huxleya linifolia* Ewart apud Fedde & Schust., Justs Bot. Jahresber. 43: 159. 1922. *Huxleya inifolia* Ewart & Rees ex Mold., Alph. List Inv. Names 27, in syn. 1942.

Bibliography: see the bibliography for the genus as a whole (above).

Illustrations: Ewart & Rees, Proc. Roy. Soc. Victoria, ser. 2, 25: [111], pl. 5. 1912.

An erect herbaceous plant, about 30 cm. tall; stems tetragonal, canaliculate, glabrous; leaves linear, opposite or sometimes alternate toward the base of the stems, 4--7.5 cm. long, sparsely pitted with minute glands beneath; flowers long-pedicellate, borne in the axils of leaves (usually 2) near the apex of the stems, without bracteoles; calyx basally tubular, about 1 cm. long, apically ampliate-patent and 5-lobed, the lobes narrow, apically acuminate, externally sparsely hairy; corolla-tube about 2.5 cm. long, the lobes subobovate, about half as long as the tube, equal in size and shape or nearly so, with tufts of hair at their base; stamens exserted, the filaments attached to the inside of the corolla-tube below its rim and protruding about 3 mm. beyond it; anthers somewhat sagittate, apically bluntly pointed; style about 2.5 cm. long; stigma slightly bifid and reaching to the mouth of the corolla-tube; fruit not known.

This apparently endemic species, type species of the genus, is based on a collection made by Maurice William Holtze (1840--1923), noted German botanist, successor to Sir Moritz Richard Schomburgk (1811--1890) as director of the Botanical Garden at Adelaide. The collection was made at or near Port Darwin, Northern Australia, in 1892.

Junell (1934) comments that "Leider stand mir kein Untersuchungsmaterial von dieser Pflanze zur Verfügung. Es ist noch ausgeschlossen, dass auch bei dieser Subtribus eine Reduktion des einer Fruchtblatts im Gynäceum erfolgt ist. Da jedoch laut Beschreibung.....und beigefügter Figur.....die Stellung der Samenanlagen vollkommen verschieden von der bei den anferen Gattungen zu sein scheint, und da die Pflanze auch sonst einen stark abweichendem Bau besitzt, ist es meines Erachtens sehr unwahrscheinlich, dass ihr Pflanze im System in dieser Subtribus [*Clerodendreae*] zu suchen ist."

Like Junell, I, too, have thus far not seen any authentic material of this apparently rare plant.

Citations: MOUNTED ILLUSTRATIONS: Ewart & Rees, Proc. Roy. Soc. Victoria, ser. 2, 25: pl. 5. 1912 (Z).

NOTES ON THE GENUS *XOLOCOTZIA* (VERBENACEAE)

Harold N. Moldenke

This is the 66th genus on which bibliographic and herbarium notes, assembled by my wife, Alma L. Moldenke, and myself over the past 52 years, are being published in the present journal. Herbarium acronyms herein employed are the same as used in all previous papers of this series in this journal (and some other journals) and are most recently fully explained in *Phytologia Memoirs* 2: 463--469 (1980).

XOLOCOTZIA Miranda, Bol. Soc. Bot. Mex. 29: 39--40. 1965.

Bibliography: Miranda, Bol. Soc. Bot. Mex. 29: 39--42 & 47, fig. 3. 1965; Guzman, Biol. Abstr. 47: 3296. 1966; Mold., Fifth Summ. 1: 77 (1971) and 2: 755 & 931. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1233. 1973; Heslop-Harrison, Ind. Kew. Suppl. 15: 144 & 151, 1974; Mold., Phytol. Mem. 2: 4, 69, & 596. 1980.

Erect scabrous shrubs with rigid bulbous-based hairs; leaves decussate-opposite, deciduous, simple, exstipulate, very short-petiolate, the blades penninerved, marginally entire; flowers borne in opposite fashion on short terminal racemes and in the axils of bracts, subactinomorphic, short-pedicellate; bracts small, deciduous; calyx gamosepalous, inferior, broadly tubular, 5-lobed, the lobes slightly unequal, costate, with broad sinuses, apically rounded, internally glabrous, unchanged in fruit; corolla gamopetalous, subhypocrateriform, white or blue, with violet-colored veins, longer than the calyx, the tube short, apically slightly infundibular, the limb 5-parted, the lobes subequal, oblong-obovate, quincuncial, apically rounded; stamens 4, subequal, attached to the middle of the corolla-tube; anthers oblong, slightly exserted, dorsifixed, the 2 thecae parallel, introrse, the connective unappendaged; staminodes absent; annular disk flat or partially concave; pistil single, slightly zygomorphic, terminal; style short, cylindric, apically hardly thickened; stigma small, subcapitate, slightly oblique; ovary 1-celled or imperfectly 2-celled; placentae 2, lamellate, more or less in juxtaposition; ovules 2, attached laterally near the apex of the placentae, pendulous.

Type species: *Xolocotzia asperifolia* Miranda.

As far as is known now, this is a monotypic genus endemic to Chiapas, Mexico, the flowers at first glance strikingly resembling those of *Petrea*, but with a non-acrescent calyx.

Miranda (1965) asserts that "El género *Xolocotzia* está muy estrechamente relacionado con el género *Petrea*, del cual de distingue, entre otras caracteres, por la falta de cresta intracalicial....y por poseer cáliz deciduo, no acrescente. No obstante, la similitud entre ambos géneros es tanta, que aun caracteres relativamente poco importantes, como las hojas ásperas con pelos

rígidos bulbosos o las bases de los mismos, se encuentran en los dos géneros. Parece natural pensar que el género *Xolocotzia* constituye parte del primitivo grupo de formas de donde derivó el especializado género *Petrea*. La marcada especialización de este último está bien señalada por los caracteres indicados que faltan en el primero, como el desarrollo de la cresta intracalicular, que, en la madurez del fruto, brinda protección a esta y a las semillas, manteniéndolas en su lugar, y por el carácter acrescente del cáliz, especialmente de sus lóbulos, que en la madurez del fruto constituyen un eficiente aparato volador. Las ventajas proporcionadas a la planta por las características mencionadas han contribuido, con toda probabilidad, de un modo decisivo a la gran difusión del género *Petrea* en América tropical [and also its rapid naturalization elsewhere]. En cambio, el género *Xolocotzia* parece ser un elemento residual, con una reducida área, de un grupo primitivo de formas."

The genus is named in honor of Efraim Hernández Xolocotzi, a Mexican botanist well known for his contributions in the fields of economic botany and phytoecology and his part in the founding of the botanical departments in agricultural schools in Mexico.

XOLOCOTZIA ASPERIFOLIA Miranda, Bol. Soc. Bot. Mex. 29: 40--42 & 47, fig. 3. 1965.

Bibliography: see that for the genus as a whole (above).

Illustrations: Miranda, Bol. Soc. Bot. Mex. 29: 47, fig. 3. 1965.

An erect asperous shrub, 2--2.5 m. tall; branches grayish-white, the youngest parts hispid-pubescent; petioles very short, 1--1.5 mm. long, hispid-pubescent; leaf-blades subcoriaceous, obovate or oblong-obovate, 3.5--5.7 cm. long, 1.5--2.5 cm. wide, apically obtuse, rounded, or retuse, marginally entire, basally cuneate; midrib prominulent above, prominent beneath; secondaries 6--8, prominulent beneath, sparsely hispid-pubescent toward the base above; racemes short, the rachis 1--1.5 cm. long; bracts pale, 1--2 mm. long, striate; pedicels short, to 5 mm. long, pubescent; calyx-tube 2.5--3 cm. long, 2--2.5 mm. wide, densely pubescent, the lobes suberect, linear-spatulate, 3.5--5 mm. long, 0.5--0.7 mm. wide, apically obtuse, with a prominent midrib externally, the sinuses 1 mm. wide; corolla-tube 3--4 mm. long, 2--2.5 mm. wide, glabrous, the limb 2.1--2.2 cm. wide, the lobes about 8 mm. long, 4.5--6.5 mm. wide; filaments 1.5--2 mm. long; anthers 1.2 mm. long; ovary 1.5 mm. long, apically short-pubescent.

This species, the type species of the genus, is based on *Miranda 5319*, from a low deciduous woods "sobre suelos calizos someros....declive de orientacion Sur" about 7 km. north of Tuxtla Gutierrez, at 900 m. altitude, Chiapas, Mexico, collected in flower on June 5, 1949, and deposited in the herbarium of the Universidad Nacional in Mexico City. *Miranda (1965)* cites also *Miranda 5903*, from the slopes of a barranca, at 470 m. altitude, in the same state. As far as known to me, the species is known thus far only from these two collections.

Citations: MEXICO: Chiapas: Miranda 5319 (Me--69313--type, Me--173592--isotype), 5903 (Me--173606). MOUNTED ILLUSTRATIONS: Miranda, Bol. Soc. Bot. Mex. 29: 47, fig. 3. 1965 (Z).

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NOTES ON THE GENUS *ADELOSA* (VERBENACEAE)

Harold N. Moldenke

Lack of time this late in life prevents me from completing the detailed monograph of this genus contemplated and earlier announced, but it seems worthwhile to place on record here the bibliographic and herbarium notes assembled over the past 52 years of work on this family of plants by my wife, Alma L. Moldenke, and myself. It is the 67th genus thus far treated in this series of papers in this (and some other) journals. The herbarium acronyms employed are the same as used in all my previous papers in *Phytologia* and are fully explained in *Phytologia Memoirs* 2: 463--469 (1980) and previously elsewhere.

ADELOSA Blume, Ann. Mus. Bot. Lugd.-bat. 1: 176. 1850.

Bibliography: Blume, Ann. Mus. Bot. Lugd.-bat. 1: 176. 1850; Walp., Ann. Bot. Syst. 3: 234. 1852; Bocq., Adansonia, ser. 1, 2: 91 (1862) and 3: 181. 1863; Pfeiffer, Nom. Bot. 1 (1): 49. 1873; Benth. in Benth. & Hook., Gen. Pl. 2 (2): 1153. 1876; Baill., Hist. Pl. 11: 115. 1891; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 37. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 140, 142, 169, & 170. 1895; Post & Kuntze, Lexicon 9 & 688. 1904; Thonner, Flow. Pl. Afr. 470. 1915; Junell, Symb. Bot. Upsal. 1 (4): 84. 1934; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 53 & 84. 1942; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 37. 1946; Mold., Alph. List Inv. Names Suppl. 1: [1]. 1947; H. N. & A. L. Mold., Pl. Life 2: 32. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 123 & 174. 1949; Angely, Cat. Estat. Bot. Fan. 17: 2. 1956; Mold. in Humbert, Fl. Madag. 174: 4 & 48--49. 1956; Mold., Résumé 155, 227, 409, & 940. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 37. 1960; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 432. 1963; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 136. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 20. 1966; Rouleau, Guide Ind. Kew. 6 & 352. 1970; Mold., Fifth Summ. 1: 259 & 377 (1971) and 2: 758 & 844. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 20. 1973; Mold., Phytol. Mem. 2: 248 & 519. 1980.

A many-branched glabrous shrub; leaves decussate-opposite, small, short-petiolate, deciduous, simple, exstipulate, cuneate-oblong or obovate, marginally entire, apically remotely serrate; inflorescence cymose, determinate, centrifugal, terminal; flowers complete, perfect, few, subsessile, borne in the axils of subu-

late bracts; prophylla 3 beneath each calyx; calyx gamosepalous, inferior, tubular, 5-parted, glabrous, actinomorphic, the lobes ovate, apically acuminate; corolla gamopetalous, zygomorphic, externally glandular-puberulent, the tube surpassing the calyx, its throat glabrous, the limb 5-parted, the lobes apically rounded, the 4 exterior (posterior) ones connate in pairs, the fifth (anterior) one inwardly arched; stamens 4, didynamous, inserted at about the top of the corolla-tube, isometrous, exserted, all fertile; filaments very short; anthers oblong-linear, dorsifixed, the two thecae parallel; pistil single, exserted; stigma bifid; ovary depressed-globose, superior, compound, bicarpellary, obsoletely 4-sulcate, imperfectly 4-celled, the cells 1-ovulate; ovules laterally attached at the middle; micropyle inferior; fruit drupaceous, turbinate-globose, apically depressed, surrounded by the ampliate fruiting-calyx, imperfectly 4-celled; seeds solitary in each cell, peltate, oblong, compressed, membranous-margined.

Type species: *Adelosa microphylla* Blume.

This is apparently a monotypic genus of Madagascar very closely related to *Premna* L. and *Clerodendrum* Burm. Briquet (1895) comments that "Diese mir völlig unbekannte Gattung wird von Baillon zu *Clerodendron* gezogen. Der Beschreibung nach scheint dieselbe doch durch den Bau der Frucht und das Samens ziemlich verschieden." Junell (1934) was also unable to secure any authentic material of the genus for study.

ADELOSA MICROPHYLLA Blume, Ann. Mus. Bot. Lugd.-bat. 1: 176. 1850.

Synonymy: *Adelosa microphylla* (Forsk.) Vierh. ex Mold., Known Geogr. Distrib. Verbenac., ed. 1, 84, sphalm. 1942.

Bibliography: see that of the genus as a whole (above).

The species has the characters given for the genus as a whole (above) with the following additions: petioles 3--7 mm. long; leaf-blades thin-chartaceous or submembranous, brunnescent or nigrescent in drying, slightly lighter in color beneath, 1--5.5 cm. long, 5--15 mm. wide, apically rounded or broadly acute, basally long-cuneate, glabrous on both surfaces, reddish when fresh.

The species is known thus far only from the type collection, *Pervillé* 626, found growing on coastal sand dunes near the edge of the sea at Ambongo, Madagascar, on February 14, 1841.

Citations: MADAGASCAR: West: *Pervillé* 626 (F--photo of isotype, It--photo of isotype, N--isotype, N--photo of isotype, P--isotype, Z--photo of isotype).

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NOTES ON THE GENUS *ACHARITEA* (*CHLOANTHACEAE*)

Harold N. Moldenke

It has seemed worthwhile to place on record here the bibliographic and herbarium notes assembled by my wife, Alma L. Moldenke, and myself on this genus over the past 52 years during our work on the *Verbenaceae*, *Avicenniaceae*, *Stilbaceae*, *Chloanthaceae*, *Symphoremaceae*, and *Nyctanthaceae*, as well as the *Eriocaulaceae*, of the world, even though time does not now permit preparation of the detailed generic monograph originally planned and previously announced. It is the 68th genus thus far treated in this series of papers in this and some other journals. The herbarium acronyms herein employed are the same as used in all the previous papers and are fully explained in *Phytologia Memoirs* 2: 463--469 (1980).

ACHARITEA Benth. in Benth. & Hook f., *Gen. Pl.* 2 (2): 1142. 1876.

Bibliography: Benth. in Benth. & Hook f., *Gen. Pl.* 2 (2): 1142. 1876; Scott Ell., *Journ. Linn. Soc. Lond. Bot.* 29: 43. 1891; Baill., *Hist. Pl.* 11: 81 & 104 (1891) and 12: [487]. 1892; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 1: 22. 1893; Briq. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 138, 142, 144, & 160. 1895; Stapf in Hook., *Icon. Pl.* 27: pl. 2685. 1901; Dalla Torre & Harms, *Gen. Siphonog.*, imp. 1, 431. 1904; Post & Kuntze, *Lexicon* 3 & 688. 1904; Thonner, *Flow. Pl. Afr.* 469. 1915; Mildbr., *Notizbl. Bot. Gart. Berl.* 11: 821. 1933; Junell, *Symb. Bot. Upsal.* 1 (4): 56 & 58. 1934; Durand & Jacks., *Ind. Kew. Suppl.* 1, imp. 1, 4. 1941; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 53 & 84. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 1: 22. 1946; Mold., *Alph. List Inv. Names Suppl.* 1: [1]. 1947; H. N. & A. L. Mold., *Pl. Life* 2: 31. 1948; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 123 & 174. 1949; Angely, *Cat. Estat. Gen. Bot. Fan.* 17: 2. 1956; Mold. in Humbert, *Fl. Madag.* 174: 4 & 41--44, fig. 5 (5--8). 1956; Durand & Jacks., *Ind. Kew. Suppl.* 1, imp. 2, 4. 1959; Mold., *Résumé* 155, 227, 404, & 438. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 1: 22. 1960; Melchior in Engl., *Syllabus Pfl.*, ed. 12, 2: 436. 1964; F. A. Barkley, *List Ord. Fam. Anthoph.* 76 & 135. 1965; Dalla Torre & Harms, *Gen. Siphonog.*, imp. 2, 431. 1965; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 7, 10. 1966; Mitra, *Elem. Syst. Bot. Angiosp.*, ed. 2 abrdg., 141. 1967; Rouleau, *Guide Ind. Kew.* 4 & 266. 1970; Angely, *Fl. Anal. Fitogeogr. S. Paulo*, ed. 1, 4: 829. 1971; Mold., *Fifth Summ.* 1: 259 & 377 (1971) and 2: 750 & 839. 1971; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 8, 10. 1973; J. Hutchins., *Fam. Flow. Pl.*, ed. 3, 490 & [909]. 1973; Mukherjee & Chanda, *Trans. Bose Res. Inst.* 39: 38 (1976) and 41: 46. 1978; Munir, *Brunonia* 1: 410, 435, & [690]. 1978; Mold., *Phytol. Mem.* 2: 248 & 514. 1980.

A rather rigid, erect, glabrous herb; leaves decussate-opposite, simple, exstipulate, sessile or subsessile, ovate or ovate-lanceolate, marginally entire, glabrous, the ones among the flowers

gradually reduced in size, the uppermost ones bract-like; flowers borne in groups of 1--3 in the leaf-axils, small, subsessile, sub-second, the upper ones clustered in a unilateral spike; prophylla minute or absent; inflorescence cymose; calyx gamosepalous, inferior, campanulate, submembranous, 10-veined, apically ampliate, glabrous, its rim equally 5-dentate; corolla gamopetalous, infundibular or hypocrateriform, glabrous, zygomorphic, the tube short, subincluded by the calyx, straight, apically somewhat ampliate, the limb short, somewhat bilabiate, 4-lobed, the lobes broad, somewhat unequal, the anterior one somewhat larger than the 3 posterior ones; stamens 4, didynamous, inserted at about the middle of the corolla-tube, included; anthers ovate, 2-celled, basally minutely mucronulate; style single, terminal, elongate, apically entire and rather obtuse; ovary compound, bicarpellary (but usually one carpel is aborted), superior, 2-celled, each cell 1-ovulate, the carpel edges turning inward from the middle of the ovary and midrib making a false partition, the placenta axile; ovules attached laterally near the base, erect; fruiting-calyx enlarged, apically ampliate, equally 5-toothed; fruit subglobose, included in the mature calyx-tube, indehiscent, unequally 2-celled or by abortion 1-celled, the pericarp membranous; seeds usually one developed, erect, basally attached by a short funiculus, oblong, smooth, with a rather thick testa and a small endosperm; embryo terete, straight; cotyledons 2, short, basally scarcely wider than the rather thick radicle.

Type species: *Acharitea tenuis* Benth.

This appears to be a monotypic genus with much of the general habit of some members of the *Lamiaceae* or *Scrophulariaceae*. It is often included in the *Verbenaceae*, but is apparently very closely related to *Nesogenes* A.DC. It is the type genus of the Tribe *Achariteae* Briq., a tribe variously placed by recent authors in the *Stilbaceae* Lindl., *Dicrastylidaceae* J. Drumm., or *Verbenaceae* J. St.-Hil., as well as in the *Chloanthaceae* (Benth.) J. Hutchins. as herein accepted.

Bentham (1876) comments: "Genus quoad inflorescentiam et calyces primo intuitu Labiatis v. Scrophularineas refert, characteres tamen omnino Verbenacearum, parumque a *Nesogenes* differt, calyce et pericarpio."

It is worth mentioning here that many authors ascribe the names published in Bentham & Hooker, *Genera Plantarum*, to "Benth. & Hook." or "Benth. & Hook. f.", but actually only pages 1217--1258 of this volume and the index were authored jointly; pages 448--869 and 1019--1215 were authored by Bentham alone (and pages 870--1019 by Hooker alone) as clearly and authoritatively stated in "On the joint and separate work of the authors of Bentham & Hooker's *Genera Plantarum*" in *Journ. Linn. Soc. Lond. Bot.* 20: 304--308. 1883.

Junell (1934) asserts that "Die beiden Gattungen *Acharitea* und *Nesogenes* stehen einander offenbar sehr nahe. Zu *Acharitea* wurden früher zwei Arten in Madagaskar gezählt. Mildbraed (1933) hat jedoch die eine von diesen Arten, nämlich *A. glandulosa* Scott

Ell., zu *Nesogenes* übergeführt, und er wirft auch die Frage auf, ob nicht *A. tenuis* Benth., auf welcher Art die Gattung gegründet worden war, ebenfalls in *Nesogenes* einzureihen sei. Mildbraed wagt jedoch nicht, diesen Schritt zu tun, da er keine Gelegenheit hatte, Material von dieser Pflanze selbst zu untersuchen."

The Angely (1971) reference in the bibliography (above) is often cited as "1970", the titlepage date, but the work was not actually published until 1971.

Excluded species:

Acharitea glandulosa Scott Ell., Journ. Linn. Soc. Lond. Bot. 29: 43. 1891 = *Nesogenes glandulosus* (S. Elliot) Mildbr., *Chloantha*-ae.

ACHARITEA TENUIS Benth. in Benth. & Hook., Gen. Pl. 2: 1142. 1876.

Bibliography: see that for the genus as a whole (above).

Illustrations: Mold. in Humbert, Fl. Madag. 174: 41, fig. 5 (5--8). 1956.

An herb with the characters of the genus (above) plus the following: petioles very short or obsolete; leaf-blades 1--2 cm. long, about 3.6 mm. wide, basally abruptly acute or rounded; calyx about 3 mm. long and wide, accrescent and to 4.5 mm. long and wide after anthesis and in fruit.

This endemic species, the type and only recognized species in the genus, inhabits low altitudes in what are probably tropophilous woods in Madagascar. It is based on *Bouton 1857*, said to have been collected on the "ile de Marosse et baie de Bombetoke" in Madagascar, and deposited in the Kew herbarium. This statement of original locality of collection is ambiguous since Marosy island is located in Antongil Bay, on the east coast of Madagascar, while Bombetoke Bay is by the Betsiboka estuary on the west coast! It is probable that two separate collections were given the same collection number, or else the collector collected the material in one of the localities and thought that he had seen what was the same species in the other site. The species is known thus far only from this original collection.

Citations: MADAGASCAR: *Bouton 1857* (K--type, K--isotype, N--isotype, N--photo of type, Z--photo of type).

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NOTES ON THE GENUS *TETRACTEA* (VERBENACEAE)

Harold N. Moldenke

As stated in the foreword of other recent papers, lack of time this late in life prevents the preparation of the detailed monograph of this genus as originally planned and previously announced, but it seems worthwhile to place on record here the bibliographic and herbarium notes on the genus assembled by my wife, Alma L. Moldenke, and myself over the past fifty-two years. The herbarium acronyms employed herein are the same as used in all previous papers in this series in this journal and elsewhere since 1934 and are fully explained in *Phytologia Memoirs* 2: 463--469 (1980) and previously elsewhere.

TETRACTEA A. Gray, *Am. Journ. Sci.*, ser. 2, 16: 98. 1853.

Synonymy: *Tetracteis* A. Gray ex Pfeiffer, *Nom. Bot.* 2 (2): 1372. 1874. *Tetracteis* "A. Gray ex Pfeiffer" apud Post & Kuntze, *Lexicon* 553. 1904. *Tetractes* Reko, *Bol. Soc. Bot. Mex.* 4: 35, sphalm. 1946. *Tetrachloa* Albers ex Mold., *Phytol. Mem.* 2: 445, in syn. 1980. *Teliclea* Woot. & Standl., in herb.

Bibliography: A. Gray, *Am. Journ. Sci.*, ser. 2, 16: 98. 1853; Torr., *Bot. U. S. Mex. Bound. Surv.* [Bot. Emory Exped.] pl. 41. 1858; C. Mull. in Walp., *Ann. Bot. Syst.* 5: 704. 1860; Bocq., *Adansonia*, ser. 1, 2: 86 & 130 (1862) and 3: 183 & 204--205. 1862; Pfeiffer, *Nom. Bot.* 2 (2): 1372. 1874; Benth. in Benth. & Hook. f., *Gen. Pl.* 2 (2): 1220 & 1270. 1876; A. Gray, *Synop. Fl. N. Am.*, ed. 1, 2: 342 & 347 (1878) and ed. 2, 2: 342 & 347. 1886; Baill., *Hist. Pl.* 11: 76, 92, & 112. 1891; Briq. in Engl. & Prantl., *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 209, 212, & 215, fig. 74 E--G. 1895; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 2: 1049. 1895; Dalla Torre & Harms, *Gen. Siphonog.* 435. 1904; Post & Kuntze, *Lexicon* 553 & 689. 1904; Woot. & Standl., *Contrib. U. S. Nat. Herb.* 16: 170. 1913; A. Nels. & Macbr., *Bot. Gaz.* 62: 146. 1916; Prain, *Ind. Kew. Suppl.* 5, imp. 1, 257. 1921; Stapf, *Ind. Lond.* 6: 273. 1931; Miranda & Hernandez Xolocotzi, *Bol. Soc. Bot. Mex.* 28: 67 & 133, pl. 61. 1933; Junell, *Symb. Bot. Upsal.* 1 (4): 108--110, 203, & 214, fig. 172. 1934; Mold., *Geogr. Distrib. Avicenn.* 14. 1939; Mold., *Suppl. List Inv. Names* 2. 1941; Wyman & Harris, *Navajo Ind. Ethnobot.* 34 & 45. 1941; Mold. in Lundell, *Fl. Tex.* 3 (1): 14 & 86--87. 1942; Mold., *Alph. List Inv. Names* 19, 21, & 43. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 12, 14, 18, & 100. 1942; Lundell & al., *Am. Midl. Nat.* 29: 489--490. 1943; Mold., *Phytologia* 2: 126. 1944; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 2: 1049. 1946; Mold., *Phytologia* 2: 159. 1946; Reko, *Bol. Soc. Bot. Mex.* 4: 35. 1946; Mold., *Alph. List Inv. Names Suppl.* 1: 21. 1947; H. N. & A. L. Mold., *Pl. Life* 2: 28, 34, & 54. 1948; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 23, 25, 26, 32, & 197. 1949; I. M. Johnst., *Journ. Arnold Arb.* 31: 192--193. 1950; Kearney, *List Citat. Place Publ. Spec. Ariz. Pl.* [typescript] 108.

1951; Kearney & Peebles, *Ariz. Fl.*, ed. 1, 724 & 730--731. 1951; Lawrence, *Taxon. Vasc. Pl.*, imp. 1, 687 & 819. 1951; McDougall & Sperry, *Pl. Big Bend Natl. Park* 148. 1951; E. J. Salisb., *Ind. Kew. Suppl.* 11: 250. 1953; Angely, *Cat. Estat. Gen. Bot. Fan.* 17: 6. 1956; Mold., *Résumé* 28, 30, 31, 38, 266, 273, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, *Ariz. Fl.*, ed. 2, imp. 1, 724 & 730--731. 1960; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 2: 1049. 1960; Prain, *Ind. Kew. Suppl.* 5, imp. 2, 257. 1960; Rzedowski, *Act. Cient. Potos.* 4: 65 & 91. 1960; Mold., *Résumé Suppl.* 3: 7 (1962), 4: 4 (1962), and 5: 4. 1962; Miranda & Hernandez Xolocotzi, *Bol. Soc. Bot. Mex.* 28: 67 & 133, pl. 61. 1963; Mold., *Résumé Suppl.* 6: 3 & 4. 1963; Howell & McClintock in Kearney & Peebles, *Ariz. Fl.*, ed. 2, imp. 2, 724 & 730--731. 1964; Mold. in Shreve & Wiggins, *Veg. Fl. Sonor. Des.* 2: 1262--1263. 1964; F. A. Barkley, *List Ord. Fam. Anthoph.* 76 & 215. 1965; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 7, 1109. 1966; Mold., *Résumé Suppl.* 13: 2 (1966) and 18: 2. 1969; Rickett, *Wild Fls. U. S.* 3 (2): 362, 366, & [367], pl. 111. 1969; G. W. Thomas, *Tex. Pl. Ecol. Summ.* 77. 1969; Mold. in Correll & Johnston, *Man. Vasc. Pl. Tex.* [Contrib. Tex. Res. Found. 6:] 1313, 1341--1342, & 1873. 1970; Rickett, *Wild Fls. U. S.* 4: 542, [543], & 798, pl. 177. 1970; Rouleau, *Guide Ind. Kew.* 186 & 291. 1970; Lawrence, *Taxon. Vasc. Pl.*, imp. 2, 687 & 819. 1971; Mahler, *Key Vasc. Pl. Black Gap*, ed. 3, 69, 70, & 104. 1971; Mold., *Fifth Summ.* 1: 57, 61--63, 74, & 450 (1971) and 2: 641, 760, & 911. 1971; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 8, 1138. 1973; Mold., *Phytologia* 34: 278 & 511. 1976; A. M. & S. A. Powell, *Sida* 7: 89. 1977; Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 499 & 511 (1978) and 44: 328, 329, & 511. 1979; Hocking, *Excerpt. Bot. A.* 33: 79 & 87. 1979; Mold., *Phytol. Mem.* 2: 50, 54, 56, 67, 445, & 578. 1980.

Low erect perennial herbs or subshrubs, basally suffrutescent; stems erect, ascending, or prostrate; leaves simple, exstipulate, deciduous, mostly oblong or ovate, marginally dentate or entire, those in the inflorescence similar but smaller; inflorescence axillary, cymose; cymes pedunculate, 1- or (mostly) 3-flowered; flowers short-pedicellate; calyx gamosepalous, inferior, broadly campanulate, 10-veined, deeply 5-cleft or 5-parted, accrescent, persistent, the lobes subequal; corolla gamopetalous, perfect, infundibular or hypocrateriform, white or yellowish, often red-tinged, medium-size, indistinctly bilabiate, the tube narrowly cylindric, exserted, the limb spreading, 5-parted, the lobes obovate-oblong, slightly unequal or subequal, imbricate; stamens 4, didynamous, fertile, often long-exserted, straight or incurved-ascending, the anterior pair longer; anthers 2-celled, the thecae distinctly parallel, basally free, longitudinally dehiscent, the connective basifixed; disk present, short, equal; pistil single, bicarpellary; style terminal, long, slender, apically bifid, the branches stigmatiferous, subulate, subequal; ovary superior, compound, apically shortly 4-lobed; ovules descending-amphitropous; fruit not fleshy, composed of 1--4 hard, obovoid, reticulate pyrenes attached to beyond the middle by a broadly keeled

areole, the fallen ones not leaving a gynobase; seeds attached laterally, exalbuminous.

Type species: *Tetraclea coulteri* A. Gray.

This is a small genus of only a few known taxa originally classified in the *Verbenaceae* by Asa Gray (1853), reclassified in the *Lamiaceae* by Benthham (1876), Jackson (1895), Briquet (1895), Post & Kuntze (1904), and Prain (1921), and finally placed back in the *Verbenaceae* by Bocquillon (1862), Junell (1934), and Angely (1956), as well as most recent authors. Salisbury (1953), Rouleau (1970), and Airy Shaw (1973) still regard it as a mint. Howell & McClintock (1960) note that "This genus is usually included in the *Labiatae*, but recent authorities consider it to belong to the *Verbenaceae* in which family it was first placed by Asa Gray." Benthham (1876) comments that "Genus habitu floribus et staminibus longis *Trichostomati* affine, ovario et nuculis *Ame-thysteae* v. *Teucree*, ab omnibus distinguitur antherarum loculis distinctis parallelis."

Junell's (1934) discussion is sufficiently important to repeat here: "In Engler & Prantl wird dieser Gattung als unsicher in die Tribus *Ajugoideae* unter den Labiaten eingereiht. Baillon.....welcher der Gattung eine ähnliche Stellung eingersumt hat, betont dabei jedoch, dass sie ebensogut bei *Verbenaceae* in der Nähe von *Ovieda* (*Clerodendron*) und *Caryopteris* eingereiht werden könnte.

"Der Fruchtknotenbau scheint mir zu beweisen, dass die Gattung in *Clerodendreae* unter zu bringen ist. Diese Umlazierung ist eigentlich ganz geringfügig, da, wie wir später sehen werden, *Clerodendreae* und *Ajugeae* einander sehr nahe stehen. *Tetraclea* kann wahrscheinlich als eine Übergangstypus zwischen diesen beiden Gruppen betrachtet werden.....Die beiden Fruchtblätter sind nur ganz wenig miteinander verwachsen. Wie bei gewissen *Clerodendron*-Arten und den unmittelbar vorstehend behandelten Gattungen dringt nämlich von der Fruchtknotenöhle in jede Plazenta eine tiefe Furche ein. Die mittleren Partien der Fruchtblätter besitzen ziemlich starke Anschwellungen. Die Samenanlagen sind oberhalb ihrer Mitte inseriert.

"Auch im übrigen spricht der Blütenbau für die Stellung der Gattung in dieser Subtribus. Eigentlich weicht nur die Frucht ab, und zwar dadurch, dass sie nicht fleischig ist. Sie besteht nämlich aus vier Nüsschen. Diese Nüsschen besitzen jedoch ungewöhnlich dicke Wandungen, welche, wie ich mich überzeugt habe, Steinzellen enthalten. Der Fruchtbau muss offenbar nicht notwendigerweise ein Hindernis für die Einreihung der Gattung in diese Subtribus bilden. Bei gewissen *Clerodendron*-Arten ist übrigens die Fruchtwandung nur ganz wenig fleischig."

He summarizes the situation thus: "*Tetraclea* hat Briquet als unsicher in *Ajugoideae* eingereiht. Der Fruchtknotenbau spricht jedoch dafür, dass die Gattung in der Subtribus *Clerodendreae* unterzubringen ist. Die Frucht ist allerdings nicht fleischig, die Fruchtwand ist aber sehr dick und erhält Steinzellen. Mit Rücksicht auf der Stellung, welche ich *Ajugeae* erteilt habe, ist die Umlazierung der Gattung eigentlich ganz unbedeutend."

An artificial key to the accepted taxa:

1. Planta annual, densely puberulent throughout with gland-tipped hairs; leaves sessile or subsessile, thick, elliptic, less than 2 cm. long.....*T. viscida*.
- 1a. Plants perennial, the pubescence eglandular; petioles to 1 cm. long; leaf-blades thinly chartaceous or submembranous.
2. Leaf-blades mostly broadly ovate, at least the smaller ones entire.
3. Corolla relatively small, to 1.5 cm. long in all; stamens well exserted, curvate.....*T. coulteri*.
- 3a. Corolla larger, the tube alone 1.6--1.7 cm. long or twice as long as the calyx; stamens straight, exserted less than 5 mm. from the corolla-mouth, not beyond the usually erect dorsal corolla-lobe.....
T. coulteri f. *subinclusa*.
- 2a. Leaf-blades mostly narrowly oblong and conspicuously toothed.....*T. coulteri* f. *angustifolia*.

TETRACLEA COULTERI A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853.

Synonymy: *Tetraclea wrightii* A. Gray ex Mold., Alph. List Inv. Names 43, in syn. 1942. *Tetraclea coulteri* var. *coulteri* [A. Gray] ex G. W. Thomas, Tex. Pl. Ecol. Summ. 77. 1969. *Tetraclea coulteri* var. *coulteri* Thomas ex Mold., Phytologia 34: 278, in syn. 1976. *Tetradymia coulteri* Gray, in herb.

Bibliography: A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853; Torr., Bot. U. S. Mex. Bound. Surv. pl. 41. 1858; Bocq., Adansonia, ser. 1, 3: 205. 1862; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 212 & 215, fig. 74 E--G. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1049. 1895; A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916; Stapf, Ind. Lond. 6: 273. 1931; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 67 & 133, pl. 61. 1933; Junell, Symb. Bot. Upsal. 1 (4): 108 & 110, fig. 172. 1934; Mold., Geogr. Distrib. Avicenn. 14. 1939; Mold., Suppl. List Inv. Names 2. 1941; Wyman & Harris, Navajo Ind. Ethnobot. 34 & 45. 1941; Mold., Alph. List Inv. Names 19, 21, & 143. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 12, 14, 18, & 100. 1942; Mold. in Lundell, Fl. Tex. 3 (1): 86--87. 1942; Lundell & al., Am. Midl. Nat. 29: 489 & 490. 1943; Mold., Phytologia 2: 126. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1049. 1946; Mold., Phytologia 2: 159. 1946; H. N. & A. L. Mold., Pl. Life 2: 54. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23, 25, 26, 32, & 197. 1949; Kearney, List Citat. Place Publ. Spec. Ariz. Pl. [typescript] 108. 1951; Kearney & Peebles, Ariz. Fl., ed. 1, 730--731. 1951; McDougall & Sperry, Pl. Big Bend Natl. Park 148. 1951; Mold., Résumé 28, 30, 31, 38, 266, 273, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 1, 730--731. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 1049. 1960; Rzedowski, Act. Cient. Potos. 4: 65 & 91. 1960; Mold., Résumé Suppl. 3: 7 (1962), 4: 4 (1962), 5: 4 (1962), and 6: 3 & 4. 1963; Howell & McClintock in Kearney &

Peebles, Ariz. Fl., ed. 2, imp. 2, 730--731. 1964; Mold. in Shreve & Wiggins, Veg. Fl. Sonor. Des. 2: 1262--1263. 1964; Mold., Résumé Suppl. 13: 2 (1966) and 18: 2. 1969; Rickett, Wild Fls. U. S. 3 (2): 366 & [367], pl. 111. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Rickett, Wild Fls. U. S. 4: 542, [543], & 798, pl. 177. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 70. 1971; Mold., Fifth Summ. 1: 57, 61--63, 74, 450, & 464 (1971) and 2: 641 & 911. 1971; Mold., Phytologia 34: 278. 1976; A. M. & S. A. Powell, Sida 7: 89. 1977; Mold., Phytologia 38: 499 (1978) and 44: 328. 1979; Hocking, Excerpt. Bot. A. 33: 79. 1979; Mold., Phytol. Mem. 2: 50, 54, 56, 57, 445, & 578. 1980.

Illustrations: Torr., Bot. U. S. Mex. Bound. Surv. pl. 41. 1858; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 212, fig. 74 E--G. 1895; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 133, pl. 61. 1933; Junell, Symb. Bot. Upsal. 1 (4): 110, fig. 172. 1934; Rickett, Wild Fls. U. S. 3 (2): [367], pl. 111 [in color] (1969) and 4: [543], pl. 177 [in color]. 1970.

A low and erect or more or less decumbent, bushy, herbaceous perennial [or "long-lived annual" according to Powell & Turner] from a deep fleshy taproot or rootstock, branched underground, with a suffrutescent branched base, or even a dwarf shrub, strongly pungent or "vile" fetid-scented with the odor of burdock or *Cucurbita foetidissima*; stems several, branching, obscurely tetragonal, ascending or spreading to decumbent, usually about 15--40 cm. tall; branchlets very slender, gray, obtusely tetragonal, densely puberulent with minute, eglandular, appressed, strigose, whitish hairs; nodes not annulate, not swollen; principal internodes 0.9--3.2 cm. long; leaves decussate-opposite, rather thinly chartaceous or submembranous [rarely leathery], gray, petiolate, strongly odoriferous; petioles slender, 4--10 mm. long, flattened, distinctly margined from apex to base, appressed-puberulent throughout, eglandular, basally not ampliate; leaf-blades thin-chartaceous or submembranous, rather uniformly bright-green on both surfaces, ovate, 1.4--4 cm. long, 6--18 mm. wide, apically sharply acute and mucronulate, marginally irregularly dentate with 2 or 3 teeth per side (the teeth coarse, broadly triangular, divergent, apically acute) or the smaller ones entire, basally acute or acuminate and prolonged into the petiole, finely puberulent with whitish, substrigose, eglandular hairs on both surfaces; midrib slender, plane above, prominulous beneath; secondaries very slender, 1--3 per side, ascending, slightly arcuate, plane and mostly obscure above, prominulous beneath, not conspicuously anastomosing; vein and veinlet reticulation very sparse, obscure or indiscernible on both surfaces; inflorescence axillary, cymose, the cymes few-flowered, mostly 3-flowered (sometimes reduced to 2 or even 1 flower); peduncles very slender, 3--8 mm. long, densely puberulent; flowers almost actinomorphic; calyx deeply 5-cleft, the tube short, turbinate, the lobes lanceolate, twice the length of the tube, apically subulate to filiform; corolla pinkish or cream-color, tinged with red outside, nearly salverform during

anthesis, to 1.5 cm. long, the tube narrow, surpassing the calyx, the limb globular and erect but oblique in bud, the lobes subequal, oval or oblong-obovate to elliptic-obovate, similar and equally spreading during anthesis or the 2 lower ones slightly cupped around the 4 recurved stamens, marginally entire, the 3 lower ones obscurely more united basally; stamens exserted from the corolla; filaments filiform, cream-color, involute in bud; anthers oblong, red, the thecae permanently parallel and distinct; style cream-color; ovary slightly 4-lobed; pyrenes pyriform, very strongly and coarsely reticulate, finely pubescent, the commissural areole large, ventral, somewhat rugose; seeds descending; chromosome number: $n = 21$ or $20 II$.

Gray (1853) gives an interesting account of the early history of this plant, saying that it "first came to my notice in the Texano-New Mexican collection made by the indefatigable Mr. Charles Wright, in the year 1849. In the same or the preceding year, it was likewise collected by the late Dr. J. Gregg, in the Northern part of Mexico. Fine specimens also were gathered by Mr. Wright on his second journey, while attached to the scientific corps of the Boundary Commission. In 1851, while under the command of Col. Graham, he collected it on the northern border of the Mexican state of Sonora; in 1852, while returning under the orders of Major Emory, he again met with it in the western part of Texas. I presume it has likewise been found by Dr. C. C. Parry, and Dr. J. M. Bigelow, during the survey of the Rio Grande from El Paso downwards; but I have seen no specimens from them. Specimens are in both of Mr. Wright's distributed collections. I have, moreover, just detected it in the late Dr. Coulter's Mexican collection, whose name, as being the first discoverer, the species may appropriately bear. The natural order to which the plant in question belongs is not very evident at first view. In Mr. Wright's notes, made at the time of gathering it, the plant is mentioned as a doubtful *Borraginacea*;--a view suggested by the deeply 4-lobed fruit, and the nearly regular, pentamerous calyx and corolla. But the leaves are opposite, and the stamens are only four in number. The latter characters, along with the quadrinuculate fruit, and the axillary cymulose inflorescence, would incline us to refer the plant to the order *Labiatae*; which again is forbidden by the regular corolla, the apparently equal stamens, and the amphitropous descending ovule. The latter character points to the true affinity of the genus, which unquestionably should be placed in the Vitaceous division of the order *Verbenaceae*; notwithstanding the deeply four-lobed ovary, and the fruit of four nucules. This remarkable character may well furnish the name of the genus;-- which I accordingly form of $\tau\acute{\epsilon}\tau\tau\alpha$, four, and $\chi\lambda\epsilon\iota\omega$, to close or shut up, referring to the four closed nutlets of the fruit." He cites the following collections, the first-named of which may well be regarded as the type of the species and genus: *Coulter 1172, Gregg 502, and Wright 462, 1513, & s.n.* [Escondido Springs, 1852]. The Coulter collection is stated as having been collected in "Mexico" without further locality mentioned.

Collectors have found this plant growing along dry roadsides and washes, in dry open ground, scrub deserts, dry gullies, and open country, on the open slopes of igneous hills, "mesas, llanos y cerros", sandy and alkaline flats, rocky hills and slopes, and level land, on limestones hills and hillsides, gravelly hills, limestone-sandstone hills, and chaparral plains, on valley floors and cedar-sotol mesa-tops and stony mountainsides, in desert roadside ditches, among low bushes and low scrub vegetation, among "roadside weeds dominated by *Larrea*", in canyons and the gravel washes therefrom, in dry or open and rocky soil, gravel, deep sandy or light grayish-tan sandy loam, brick-red or "tight" red sandy soil, sandy- or dry sandy-clay, loose sand, limestone or caliche soil, in mesquite grassland, in shallow soil with much rock and gravel, and in low shrub areas on grassland, at altitudes of 350--2195 m., in anthesis and in fruit from March to November.

The corollas are described as having been "white" on Vandergriff 37, "greenish-white" on Whitehouse 8750, "cream-white" on Correll & Schweinfurth 15700, "cream" on Correll & Johnston 19978, Correll & Wasshausen 27905, Henrickson 12174a & 12497, Johnston & al. 11337, Parks & al. 2050, Warnock & McBryde 14968, and Whitehouse 14744, "pale-cream" on Wiggins & Rollins 179, "cream-white with purple tinge" on Henrickson & Lee 15854, "cream tinged with pink-maroon" on Henrickson & Lee 16021, "cream tinged with red or pink" on Wood 791, "cream or tinged red" on McVaugh 8255, "cream- or creamy-yellow" on Powell & Turner 2690 and Webster 424, "cream-yellow, pink-tinged in the tube" on McVaugh 18499, "cream to orange" on Warnock & Turner 721, "pink-cream" on Parker 7259, "pinkish" on Lundell & Lundell 9966, "flesh-color" on Powell & al. 1581 and Turner & Tharp 53-478, "flesh-yellow" on McCart 7446, "pale yellowish-green (near 75Y9/6)" on Straw & Forman 1522, "yellow" on Crutchfield 92 and Mick & Roe 6, "yellowish" on Lundell & Lundell 14183 and Rzedowski 6265, "light-yellow" on Smith & Butterwick 76, "pale-yellow" on White 2145, "yellow or dingy-white" on Johnston & al. 3556, "yellow with some pink" on Henrickson & Wendt 12278, "dull-yellow" on Correll & Rollins 23692, and "yellow within, red outside" on Henrickson 6425.

McVaugh reports the species "locally abundant under pines", while Mears found it "common with *Melampodium*, *Zinnia*, *Baileya*, & *Bahia*".

In Texas -- Powell found it in *Larrea-Prosopis* association on rocky limestone hillsides in Brewster County, where Rowell encountered it in sotol-*Agave lecheguilla* association in rocky limestone loam; in Ector County Collins found it in deep sand of the high plains dominated by mesquite and grasses; in Pecos County McVaugh reports it "locally abundant under pinyons on rocky limestone steppes", Warnock refers to it as "infrequent in limestone soil"; in Presidio County Muller encountered it on shrubby grassland transition zone, while Warnock describe it as "frequent" along roadsides; in Starr County Correll & Johnston found it only "occasional" in gravelly soil; in Terrell County Parks & al. describe it as "infrequent"; in Tom Green County Bray reports it

"common in chaparral clumps", while Smith found it inhabiting "dry slopes and moist areas at base of slopes, on a limestone base"; and in Val Verde County Smith & Butterwick refer to it as "rare". Warnock & Turner as "infrequent", Warnock & McBryde as "infrequent in limestone soil", McVaugh as "scarce in open stony ground", but Warnock also calls it a "frequent and widespread perennial, a good dove and quail feed".

In Arizona -- Hanson reports it "infrequent in sandy soil" of Coconino County, while Parker encountered it in "rocky soil with mesquite-palo verde association on mountain foothills" and in rocky soil on slopes in Emory oak - Mexican blue oak association in Pima County.

In New Mexico -- Higgins found it growing in "gravelly limestone soil of grassland community" and in "wet meadows in *Sporobolus-Juncus-Scirpus* community".

In Chihuahua -- Chiang, Wendt, & Johnston found it "in interface between pastizal and matorral inerme desértico on low hills of basic igneous rock, in thin sandy soil with *Bouteloua gracilis* and *Larrea tridentata*" and "in arroyo and fan areas in gravelly calcareous sandy loam with *Larrea tridentata*, *Acacia neovernicosa*, and *Dasyllirion* sp.", also "in areas of izotal on mid slopes of steep limestone, with chaparral on top, matorral desértico inerme on lower portions, mostly north-facing, in calcareous gravelly soil with *Dasyllirion*, *Yucca*, and *Agave* (higher up with *Quercus*, *Garrya* etc." and "in matorral desértico inerme and degraded pastizal on steep limestone slopes of small basalt mesas in calcareous gravel or gravel derived from extrusive igneous rocks, with *Agave lecheguilla*, *Bouteloua ramosa*, *Ephedra antisiphilitica*, *Acacia glandulosa*, and *Viguiera*", also in "matorral inerme subdesértico on limestone-like bedded volcanic ash and calcareous gravelly soil with *Forestiera angustifolia*, *Rhus microphylla*, *Cassia wislezenii*, *Acacia glandulosa*, *Ephedra antisiphilitica*, and *Parthenium incanum*".

In Coahuila -- Chiang and his associates have encountered the plant "in matorral desértico con espinas laterales on steep limestone hills in calcareous gravel with *Hechtia texensis*, *Acacia schottii*, and *Larrea tridentata*" and in "caliche with *Condalia viridis*, *Berberis trifoliata*, *Flourensia cernua*, and *Larrea*"; Henrickson reports it as an "infrequent gray-green leaved perennial on gypsum with *Fouquieria shrevei*, *Agave*, *Selaginella*, *Petalonyx*, and *Hechtia*" and "an infrequent plant on clay flats with *Fouquieria*, *Coldonia*, *Agave*, *Larrea*, *Jatropha*, *Sericodes*, etc."; "also frequent with *Larrea*, *Selinocarpus*, *Grusonia*, *Agave lecheguilla*, *Tecoma*, etc." and "on rocky margins of arroyo"; Mick & Roe found it growing "in desert with extensive desert pavement and *Agave*, *Aloë*, and cacti common"; Ward & Lott report it as inhabiting areas of low shrub vegetation of *Parthenium incanum*, *P. argentatum*, *Agave lecheguilla*, *Ephedra antisiphilitica*, *Acacia berlandieri*, *Mimosa*, sotol, etc.

In Durango -- Straw & Forman report the species common in sandy washes.

In Jalisco -- Rzedowski reports it from "terrenos poco inclin-

ados con vegetacion de pastizal".

In San Luis Potosi -- Henrickson found the plant "in canyons with *Agave lecheguilla*, *Larrea*, *Acacia*, *Prosopis*, *Cordia*, etc." and "in Chihuahuan Desert on limestone hills with *Prosopis*, *Acacia*, *Opuntia*, *Hechtia*, *Dasyllirion*, etc."

In Tamaulipas -- Stanford and his associates report it from a "broad damp riverbed with varied vegetation of large shrubs, small trees, and herbs".

In Zacatecas -- McVaugh reports it "locally abundant on hills with grass, *Ipomoea*, and cacti".

Kearney & Peebles (1960) assert that in Arizona the species is found at altitudes of "4500 feet or lower", flowering from April to August. Wiggins (1964) says that it occurs "In sandy clay soil, dry open ground, and broad damp riverbeds, chiefly in the foothills. Sonoran Zones, southwestern Pima County, Arizona, to Texas and south to Puebla". Gray (1878) says: "Rocky hills, S.W. Texas to Arizona", flowering in summer. Rickett (1969) asserts: "April to September: on rocky hills from western Texas to Arizona and Mexico". In Lundell (1942) material is cited from Brewster, El Paso, Jeff Davis, Midland, and Wood Counties, Texas.

Dr. F. Miranda, in a letter to me dated October 15, 1947, cites Patoni s.n. from Tehuacan and Miranda 1989 from Matamoros, Puebla.

A. M. Powell has determined the chromosome number as $n = 21$ on the basis of Powell & Turner 2690 and $n = 20$ II on Turner & Turner 7090.

A single vernacular name, "wóláćí.ʔbéz", is reported for the species.

McVaugh 10648 exhibits all the leaves marginally entire; Howell 24400 has the calyx only 4-lobed; Chiang, Wendt, & Johnston 8739c & 9695e have very small flowers and unusual teeth on the leaf-margins. Lundell (1943) notes that Lundell & Lundell 9966, from Hidalgo County, Texas, has "the calyx lobes....fili-form at [the] apex rather than subulate, [but] additional collections are needed to determine if the difference is of varietal importance.

An unknown hand has suggested of the sheets of Warnock & Barkley 14798M & 14803M in the University of Texas herbarium that these collections may represent what is now known as *f. subinclusa*.

Tetradlea wrightii, referred to in the synonymy (above), is a cheironym apparently based on *C. Wright* 1512 in the Torrey Herbarium. *C. Wright* 458 is a mixture with *Lantana macropoda* Torr.

Material of typical *T. coulteri* has been misidentified and distributed in some herbaria as *T. coulteri* var. *angustifolia* (Woot. & Standl.) A. Nels. & Macbr., *T. subinclusa* I. M. Johnston., *Teucrium laciniatum* Torr., *Trichostema arizonicum* A. Gray, *Ruellia* sp., and *Acanthaceae*. On the other hand, the Butterwick & Lott 3675, F. S. Earle s.n. [Barstow, June 1901], Hahn s.n., Higgins 6706 & 6778, Lehto, Keil, & Pinkava 5315, 5537, 5661, 5675, & 5798, Paray 2625, Rzedowski 6356 & 7991, Small & Wherry

12082, Waterfall 7757, & Whitehouse 16883, distributed as typical *T. coulteri*, are better regarded as representing *f. angustifolia* (Woot. & Standl.) Mold., while Correll & Johnston 20205 is *T. coulteri f. subinclusa* (I. M. Johnst.) Mold., Albers & Haskell 49278 is *T. viscida* Lundell, Cohn & Barkley 13176 is *Isanthus brachiatus* (L.) B.S.P. in the Lamiaceae, and Taylor & Taylor 15630 is something in the Nyctaginaceae.

Citations: TEXAS: Andrews Co.: Vandergriff 37 (Lk). Bexar Co.: Parks 43130 (Au--127182), 44266 (Au--127215). Brewster Co.: Cory 53126 (Sm); Marsh 46 (Au--213990); A. M. Powell 2739 (Au); Rowell 11227 (Lk); E. D. Schulz s.n. [Alpine, May 1922] (N); Steiger 652 (N); Turner & Tharp 53-478 [Turner 3250] (Au--127208); Turner & Turner 7090 (Ld); Warnock 21408 (Au--127269), T.40 (Au--127210); Whitehouse 11476 (Sm); M. S. Young s.n. [9/17/15] (Au--127191). Concho Co.: S. Hayes s.n. [Concho, May 21st, 1858] (N). Crockett Co.: Tharp 43-824 (Au--127214, N). Dimmit Co.: Correll & Johnston 19508 (Ld); Johnston, Tharp, & Turner 3538 (Au--127218, St), 3556 (Au--127217). Ector Co.: T. Collins 200 (Lk), 263 (Lk), 1276 (Lk). El Paso Co.: J. I. Carlson s.n. [El Paso, May 9, 1915] (Gg--24499); M. K. Clemens 11 (Gg--24496); Hitchcock, Rethke, & Raadshooven 4336 [U. S. Nat. Arb. 146068] (Gg--298998, Ld); Whitehouse 8750 (Au--127192, Mi, Sm); C. Wright 462 (N). Hidalgo Co.: Lundell & Lundell 9966 (Ld, Mi); E. J. Walker 14 (Au--127193). Jeff Davis Co.: Earle & Tracy 159 (Au--127194, N), 299 (N); S. M. Tracy 299 (N). Jim Hogg Co.: A. D. Wood 791 (Au--253283). Kimble Co.: J. Reverchon 1386 (Pa). Midland Co.: S. M. Tracy 7988 (N). Pecos Co.: R. McVaugh 10648 (Au--235971, Ld, N); Turner & Tharp 3160 (Au--127181); Warnock 10492 (Ld), 10648 (Mi), 46206 (Au--65955). Presidio Co.: Correll & Rollins 23692 (N); Correll & Wasshausen 27905 (Ld); Hinckley 1056 (Au--127211, N, N, Sm), 1335 (N); C. H. Muller 8412 (St); Warnock 20707 (Au--127186), T. 58 (Au--127206). Reeves Co.: Parks Rx.3108 (Au--127187). Starr Co.: Correll & Johnston 18073 (Ld); Ramos, Sandoval, Salazar, & McCart 7866 (Au--222226); R. Runyon 17 (Au--269968); Tharp s.n. [June 30, 1950] (Au--193869); A. D. Wood 724 (Au--247077), 780 (Au--253291). Terrell Co.: Lundell & Lundell 14183 (Ld, N); Parks, Turner, & Warnock 2050 [139] (Au--127184); Webster 424 (Au--127201). Tom Green Co.: Baird 4 (Au--248280); Bray 345 (Sm); Correll & Johnston 24618 (Ld); McGenee 75 (Ne--128314); Rowell 15270 (Sl); C. Smith 159 (N). Val Verde Co.: Albers 46138 (Au--165956); Davies & Turner 79230 (Au); M. E. Jones 26193 (Gg--251569); R. McVaugh 8255 (Au--179031, Mi); Smith & Butterwick 76 (Ld); Warnock 11233 (Ld, Ws); Warnock & McBryde 14968 (Ld); Warnock & Turner 721 (Ld); Whitehouse 19744 (Mi). Webb Co.: Baird s.n. [Oct. 1960] (Au--195729); Benavides 77 (Au--233313); D. Cardenas 92 (Ld); McCart 7446 (Ok); Sanchez 46 (Ld); Soto, Herrera, & McCart 8071 (Au--222227); Vergara, Arreola, Davila, Hein, & McCart 8599 (Au--236368). Zapata Co.: Bernal 28 (Ld); Correll & Schweinfurth 15700 (Ld). County undetermined: C. Wright 458 in part (Du--177392 in part). NEW MEXICO: Chaves Co.: Higgins 8698 (N); Crutchfield 92 (Ld). Dona Ana Co.: F. R. Fosberg S.4054 (Gg--298997); Plank s.n. [July 1894] (N); Wooton

s.n. [near Las Cruces, Aug. 12, 1895] (C, N); Wooton & Standley *s.n.* [Oct. 15, 1907; Herb. Field Mus. 27435] (Ws). Grant Co.: Mearns 2306 (N). Guadalupe Co.: Higgins 9085 (N). Sierra Co.: Barneby 3052 (N); Mrs. J. M. Beals *s.n.* [Lake Valley, June 1904] (Mi); O. B. Metcalfe 1280 (Gg--24498). Socorro Co.: Plank *s.n.* [August 20, 1895] (N). County undetermined: Herb. Columbia Univ. *s.n.* (C); C. Wright 1512 (T). ARIZONA: Cochise Co.: Barkley 14A 545c (Au--127225); Eastwood 5598 (Gg--24497); C. B. Wolf 2548 (Gg--174450). Coconino Co.: Hanson A.234 (N), A.234a (Au--127226); J. T. Howell 24400 (Gg--342812); Ripley & Barneby 4899 (Gg--302318). Pima Co.: Gilman 67 (N), 153 (N); Griffiths & Thornber 3341 (N); A. R. Moldenke 148 (Fg, Z); K. F. Parker 7259 (Gg--356536), 7449 (Gg--371779); Peebles & Harrison 6991 (N); Pringle *s.n.* [Tucson, April 27, 1883] (Bc, Pa); Thornber 2327 (Ld, N), *s.n.* [Wilmot, August 22, 1902] (N); Toumey *s.n.* [Tucson, Oct. 11, 1894] (N). Yavapai Co.: H. H. Rusby 783 (Mi, Pa), *s.n.* [Ft. Verde, June 22, 1883] (C). County undetermined: Eisen *s.n.* [June 1892] (N). MEXICO: Chihuahua: Chiang, Wendt, & Johnston 8695e (Ld), 8739c (Ld); Henrickson & Lee 15854 (Au); Johnston, Wendt, & Chiang C. 11337 (Ld), 11432a (Ld); Edw. Palmer 176 (N); Pringle *s.n.* [mesas y cerros, 17 Set. 1886] (Me), *s.n.* [llanos y cerros, 17 Set. 1886] (Me); Wenst, Chiang, & Johnston 9794 (Ld); S. S. White 2145 (Mi); C. Wright *s.n.* [Depprich 7797] (Sm). Coahuila: Chiang, Wendt, & Johnston 8263b (Ld); Cole, Hinckley, & Pinkawa 4161 (Te--67196); Henrickson 6727 (Ld), 12174a (Ld), 12497 (Ld); Henrickson & Lee 16021 (Au); Henrickson & Wendt 12278 (Ld); Johnston, Wendt, Chiang, & Sastrup 12347 (Ld); Kenoyer & Crum 2540 (Mi), 2657 (Mi); Latorre 83 (Au--225508); Mick & Roe 6 (Ws); Edw. Palmer 121 (N); Powell, Patterson, & Ittner 1581 (Au--267754); Powell & Turner 2690 (Ld); Warnock & Barkley 17498M (Au--127224), 14803M (Au--127223); Wendt & Lott 1233 (Ld); Wynd & Mueller 477 (N, St), 485 (Me, Mi, N). Durango: Correll & Johnston 19978 (Ld); E. W. Nelson 4722 (N); Straw & Forman 1522 (Mi); Waterfall *s.n.* [August 11, 1959] (St); Waterfall & Wallis 13361 (St), 13750 (St). Hidalgo: Mears & Mears 1598 (Au--257818); Purpus 1413 (N). Jalisco: J. Rzedowski 14212 (Ip, W--243660). Nuevo León: R. F. Smith M.628 (Au--208811). Puebla: F. Miranda 1989 (Me); Patoni *s.n.* [Tehuacan, Setiembre 1916] (Me). San Luis Potosí: Henrickson 6425 (Ld); J. Rzedowski 6265 (Ip), 6756 (Au--243742, Ip); Schaffner 356 [Herb. Prager 18758] (Gg--87682), 636 (Me, N). Sonora: Wiggins & Rollins 179 (Mi, N). Tamaulipas: Stanford, Retherford, & Northcraft 933 (N). Zacatecas: R. Mc Vaugh 18479 (Mi, N).

TETRACLEA COULTERI f. *ANGUSTIFOLIA* (Woot. & Standl.) Mold., *Phytologia* 44: 328. 1979.

Synonymy: *Tetraclea angustifolia* Woot. & Standl., *Contrib. U. S. Nat. Herb.* 16: 170. 1913. *Tetraclea coulteri* var. *angustifolia* (Woot. & Standl.) A. Nels. & Macbr., *Bot. Gaz.* 62: 146. 1916. *Clerodendrum nelmesianum* Mold., *Geogr. Distrib. Avicenn.* 14, nom. nud. 1939. *Clerodendron malmesianum* Mold., *Suppl. List Inv. Names* 2, in syn. 1941. *Tetraclea coulteri angustifolia* (Woot. & Standl.)

A. Nels. & Macbr. ex Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. 1873. 1970; Fifth Summ. 2: 641, in syn. 1971. *Teliclea angustifolia* Woot. & Standl., in herb.

Bibliography: Woot. & Standl., Contrib. U. S. Nat. Herb. 16: 170. 1913; A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916; Prain, Ind. Kew. Suppl. 5, imp. 1, 257. 1921; Mold., Geogr. Distrib. Avicenn. 14. 1939; Mold., Suppl. List Inv. Names 2. 1941; Mold., Alph. List Inv. Names 43. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 12, 14, & 100. 1942; Mold. in Lundell, Fl. Tex. 3 (1): 87. 1942; Mold., Phytologia 2: 159. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23, 25, & 197. 1949; Kearney, List Citat. Place Publ. Spp. Ariz. Pl. [typescript] 108. 1951; Kearney & Peebles, Ariz. Fl., ed. 1, 730--731. 1951; Mold., Résumé 28, 30, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 1, 730--731. 1960; Prain, Ind. Kew. Suppl. 5, imp. 2, 257. 1960; Mold., Résumé Suppl. 3: 7 (1962), 5: 4 (1962), and 6: 3 & 4. 1963; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 2, 730--731. 1964; Mold., Résumé Suppl. 18: 2. 1969; Rickett, Wild Fls. U. S. 3 (2): 366. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Rickett, Wild Fls. U. S. 4: 542 & 798. 1970; Mold., Fifth Summ. 1: 57, 61, 74, & 450 (1971) and 2: 641 & 911. 1971; Mold., Phytologia 44: 328. 1979; Mold., Phytol. Mem. 2: 50, 54, 56, 67, 445, & 578. 1980.

This form differs from the typical form of the species in having its leaf-blades in general more narrowly oblong and conspicuously toothed. It is, at best, a poorly defined form. most certainly not deserving the specific or even varietal status some authors have conferred upon it.

Collectors refer to it as an "annual" or perennial herb, as an herb with a perennial rootstock, or as an erect root-suckering herb, the foliage gray-green, the flowers fetid, the calyx 4- or 5-parted, and the corolla composed of 5 petals. Howell & McClintock (1960) note that "specimens from Cochise County [Arizona] may be referable" to this form, but have "more slender, less pubescent, narrower calyx lobes, smaller corollas, [and] more strongly reticulate nutlets but there seems to be intergradation with typical *T. coulteri*." They cite Ripley & Barneby 4899 and J. T. Howell 24400 from Coconino County, noting that "both have 4-lobed calyx and plants with [both] 4- and 5-lobed calyces have been collected elsewhere."

Recent collectors have found *f. angustifolia* growing in "interfirm alluvium", deep sand of moving dunes, fine sandy loam of saline flats, gypseous gravel and clay, red sandy loam of open mesquite grasslands, limestone or red sandy soil, "gypsum soil on level plains in *Gutierrezia-Prosopis* association", sandy or gravelly soil in general, and in the gravel wash of canyons, in desert scrub or grassland communities, in dry arroyos, rocky desert grassland, deep sandy loam, and gravelly calcareous soil along dry creekbeds, in "shallow soil with rock and gravel", in "buff silt of alluvial cover", and in "deep sandy soil dominated by mesquite and creosotebush", on gravelly ridges, dry creek banks, high open plains,

limestone hills, "level limestone upland", sandy, limey or gypsum flats, rocky hillsides, *Larrea*-covered bajada, desert floors, saline soil banks, and "interdune flats of sandy loam" or "on arid grassy plains of reddish sandy loam", as well as "under bushes with *Agave lecheguilla* on flats", at altitudes of 750--2150 m., in flower and fruit from April to December.

The corollas are said to have been "white" on Correll & Johnston 19350 and Hinckley 1928, "cream-white" on Stuessy 945, "yellowish-white" on Johnston 2730, "ivory-color" on Muller 8412, "cream" on Correll & Johnston 19989, Ferris & Duncan 2492, Rowell 8298, Warnock 5550, Warnock & Hinckley BG.184, Warnock & McBryde 14862, and White 2451, "cream-yellow" on Henrickson 6202 & 6968 and Powell 2194, "yellowish" on Lundell & Lundell 14289, Rzedowski 7991, and White 2048, "pale-yellow" on Powell 2423, "dull-yellow" on Correll & Rollins 23692, "yellow" on White 2188, "yellowish with purple lines" on Henrickson 5678, and "lobes pinkish, yellowish within" on Lundell & Lundell 14210. Buds were specially collected along with Turner & Butterwick 510.

In Texas collectors report the plant as follows: Lundell (1942) "in depressions and on banks, especially on dry rocky plains" from Terrell to Presidio and Hudspeth Counties. In Brewster County: rare (Warnock) or infrequent (Warnock & Hinckley) or "locally frequent in rocky creekbeds" (Rowell). In Crane County: "an infrequent ill-smelling perennial herb" (Warnock). In El Paso County: frequent or infrequent and widespread; an excellent dove feed" (Warnock). In Pecos County: infrequent or frequent in limestone soil (Warnock). In Presidio County: infrequent on low hills (Warnock) or common on rocky slopes in shrubby grassland of transition foothills (Muller). In Terrell County: frequent (Warnock & McBryde) and in depressions and on banks of dry rocky plains (Palmer). In Winkler County: occasional with many of the shrubby dominants of the Chihuahuan Desert (Rowell).

In New Mexico - Eddy County: infrequent on sandy roadsides with *Solanum rostratum*, *Datura stramonium*, and *Bothriochloa* (Smith & al.)

In Chihuahua: common on roadsides (Engard & Gentry, Andrew & Alison Moldenke) and "a scattered annual on open Chihuahuan Desert flats with *Larrea*, *Parthenium*, *Yucca*, *Opuntia*, *Allionia*, *Flourensia*, etc. in shallow sandy-clay soil".

In Coahuila: fairly common on grassy flats and dry sandy hillsides in the calcareous foothills (Stewart) or "frequent with *Hilaria*, *Prosopis*, *Opuntia*, *Larrea*, etc.", "on sandy flats with *Larrea*, *Acacia*, *Opuntia*, *Jatropha*, etc.", and in open Chihuahuan Desert with rocky sandy-loam soil and *Agave* and *Bouquieria* (Henrickson).

In Durango: scattered on *Larrea* deserts (Stuessy).

In San Luis Potosi: on deserts with *Larrea* and *Yucca* dominant (Richardson).

The *Clerodendrum nelmesianum*, listed in the synonymy (above), is based on an unnumbered Ludwig Wahn collection from somewhere in Mexico, gathered in 1865 or 1866, and deposited in the Paris herbarium. It was named in honor of Ernest Nelmès, librarian at

the Royal Botanic Gardens, Kew, botanical bibliographer and expert on the Cyperaceae.

Material of *T. coulteri* f. *angustifolia* has been misidentified and distributed in many herbaria as typical *T. coulteri* A. Gray and in some as *Teucrium laciniatum* Torr. On the other hand, the Lundell & Lundell 14183, C. H. Muller 8412, Smith & Butterwick 76, and Waterfall s.n. [August 11, 1959], distributed as f. *angustifolia*, actually seem better regarded as representing the typical *T. coulteri* A. Gray.

Citations: TEXAS: Andrews Co.: *T. Collins* 1297 (Lk). Brewster Co.: Butterwick & Lott 3675 (Au); Correll & Johnston 19350 (Ld); L. C. Higgins 6778 (N); Lundell & Lundell 14210 (Ld, N); A. R. Moldenke 170 (Z); C. M. Rowell 5109 (Lk); Steiger 31 (N), 416 (N), 1090 (N); Warnock 5550 (Au--127188), 21233 (Au--127190); Warnock & Hinckley BG.184 (Ld). Crane Co.: Tharp s.n. [7/11/41] (Au--127198); Warnock 14654 (Au--127975, Ld). Culberson Co.: Correll & Johnston 18558 (Ld); Janszen 413 (Au--127185); Small & Wherry 12082 (N); Tharp & Jabszen 49-1181 (Au--127205); Waterfall 3765 (N), 4457 (Au--298068, N), 7757 (N); Whitehouse 16883 (Mi, Sm). Ector Co.: *T. Collins* 1030 (Lk). El Paso Co.: Vasey s.n. [El Paso, Mch. 1881] (Pa); Warnock 5777 (Au--127495, Ld), 13673 (Ld). Hudspeth Co.: D. S. Correll 26584 (Ld); Ferris & Duncan 2492 (Gg--24500, N); A. R. Moldenke 161 (Fg, S); Powell 2423 (Au); Tharp 43-823 (Au--127212). Jeff Davis Co.: A. R. Moldenke 166 (Fg). Midland Co.: Tracy 7988 (Au--127199). Pecos Co.: Cory 40294 (Au--127213); Warnock 7860 (Au--127189, Au--127204, Ld), 46157 (Au--127203). Presidio Co.: Correll & Rollins 23692 (Ld); Eggleston 17309 (N); Hinckley 1728 (Au--127196); Lundell & Lundell 14289 (Sm); C. H. Muller 8412 (Ld, N, Sm); Warnock 20706 (Au--127197), 20722 (Au--127207); York 50-90 (Au--127183), 48278 (Au--127216). Terrell Co.: E. J. Palmer 33520 (N); Turner & Butterwick 510 (Ld); Warnock & McBryde 14862 (Au--127974, Ld). Ward Co.: F. S. Earle s.n. [Barstow, June 1901] (N); Powell 2194 (Au); T. A. Williams s.n. [May 19, 1900] (Ld). Winkler Co.: *T. Collins* 1087 (Lk), 1221 (Lk); C. M. Rowell 8270 (Lk), 8298 (Lk, Lk), 11548 (Lk). NEW MEXICO: Chaves Co.: Earle & Earle 292 (N). Culberson Co.: Waterfall 7757 (N). Dona Ana Co.: Wooton s.n. [Aug. 26, 1899] (N). Eddy Co.: Higgins 6706 (N); Smith, Butterwick, & Whalen 331 (Ld); Whitehouse 11480 (Sm), s.n. [July 7, 1931] (Au--127220). Hidalgo Co.: McGill & Keil 8501 (N); A. R. Moldenke 141 (Am, B, Fg, S). Luna Co.: Mulford 1039 (N). Otero Co.: M. C. Johnston 2730 (Au--127219). Sierra Co.: O. B. Metcalfe 1280 (N). Socorro Co.: H. H. Rusby 347 (Mi). ARIZONA: Cochise Co.: Thornber 9198 (St). Pima Co.: Rothrock 588 (Pa); Wooton s.n. [Tucson, July 8, 1911] (N). MEXICO: Chihuahua: Engard & Gentry 625 (Ld); Henrickson 5678 (Ld); LeSueur Mex.803 (Au--127221); Moldenke & Moldenke 2109 (Ac, Ld); Waterfall 12500 (Mi, St); S. S. White 2048 (Mi), 2188 (Mi), 2451 (Mi). Coahuila: Henrickson 6202 (Ld), 6968 (Ld); I. M. Johnston 2602a (Au--127222), 8569 (Ld); Lehto, Keil, & Pinkava 5315 (Ld, Te--67197), 5537 (Te--67198), 5661 (Te--67195), 5675 (Te--67199), 5798 (Te--67200); Edw. Palmer 1104 (Pa); R. M. Stewart 609 (Ld), 1334 (Ld--299892). Durango: Correll & Johnston 19989 (Ld); Gregg

502 (T); *Stuessy* 945 (Au--257660). San Luis Potosí: *Paray* 2625 (Ip); *C. C. Parry* 726 (Pa); *Richardson* 1554 (Au); *J. Rzedowski* 6356 (Ip), 7991 (Ip, Ip), 9386 (Ip). State undetermined: *Hahn s.n.* (F, N, N--photo, P, Z--photo).

TETRACLEA COULTERI f. *SUBINCLUSA* (I. M. Johnst.) Mold., *Phytol. Mem.* 2: 445. 1980, stat. nov.

Synonymy: *Tetraclea subinclusa* I. M. Johnst., *Journ. Arnold Arb.* 31: 192. 1950. *Tetraclea coulteri* var. *subinclusa* (I. M. Johns.) Mold., *Phytologia* 38: 499. 1978.

Bibliography: I. M. Johnst., *Journ. Arnold Arb.* 31: 192--193. 1950; E. J. Salisb., *Ind. Kew. Suppl.* 11: 250. 1953; Mold., *Biol. Abstr.* 66: 1277. 1978; Mold., *Phytologia* 38: 499. 1978; Hocking, *Excerpt. Bot. A.* 33: 79. 1979; Mold., *Phytol. Mem.* 2: 67, 445, & 578. 1980.

A low, often prostrate, perennial herb, abundantly clothed with minute retrorse hairs; stems loosely ascending or prostrate, 5--15 cm. long, very sparsely or hardly at all branched, issuing from a heavy, deep taproot; principal internodes 5--22 mm. long; petioles often 2--10 mm. long; leaf-blades ovate or lanceolate, 1--2 cm. long, 5--18 mm. wide, widest below the middle, apically acute or rounded to gradually attenuate, marginally entire, basally obtuse or acute and abruptly or gradually attenuate into the petiole, somewhat paler beneath, often whitish and with a few inconspicuous veins; pedicels 1--3 mm. long; calyx-lobes during anthesis cuneate, 6--8 mm. long; corolla large, conspicuous, yellow or becoming purplish, its tube 1.6--1.7 cm. long, 1.5--2 mm. wide, twice as long as the calyx, externally glabrous, internally more or less villous except above the middle, the lobes obovate, 6--7 mm. long, 2.5--3.5 mm. wide; filaments straight, 6.5--9 mm. long, very slightly exserted, subglabrous or else villous below the middle, inserted 2.5--3 mm. below the mouth of the corolla-tube, exserted 2--5 mm. from the mouth, reaching the middle of or almost to the apex of the erect upper corolla-lobe; anthers oblong, 1.2--1.9 mm. long, 0.5--0.9 mm. wide; seeds 4--5 mm. long.

This form is based on *I. M. Johnston 8504*, local on limestone beds between gypsum strata on an escarpment at the south end of Canada Oscuro, near Tanque La Luz, Coahuila, Mexico. Johnston (1950) cites also *Johnston & Muller 741* and *Stewart 2830* from Coahuila. He comments that "Although evidently related to the polymorphic *T. Coulteri* Gray, the present plant differs in its very large corollas in which the tube is about twice as long as the calyx and the stamens are straight and are exserted less than 5 mm. from the corolla-tube and not beyond the usually erect dorsal corolla-lobes. In Coahuila the common form of the genus is that described as *T. angustifolia* Woot. & Standl., a loosely branched usually erect plant with narrow toothed leaves and small corollas with much curved long-protruding stamens. The proposed species is most like typical *T. Coulteri* of Hidalgo, San Luis Potosí and Tamaulipas, which also has broad entire leaves but a looser growth habit and very much smaller corollas with well exserted stamens."

Stewart refers to the plant as "scarce", with a bad odor. Other

collectors have found it growing prostrate on limestone ledges on small hillsides, in arroyos, on gypsum flats, in limestone crevices, on rocky slopes, and on limestone between gypsum strata on escarpments, in anthesis from May to August, and in fruit in July. The corolla is described as having been "yellow" on *Johnston & Muller 741* and *Stewart 2830*, "cream" on *Correll & Johnston 20205*, and "reddish-purple" on *Johnston 8504*.

Material of this form has been misidentified and distributed in some herbaria as typical *T. coulteri* A. Gray.

Citations: MEXICO: Coahuila: *Johnston & Muller 741* (Ld--301250); *Powell & Turner 2724* (Ld). Colima: *I. M. Johnston 8504* (Ld--302196--isotype, Z--isotype). Durango: *Correll & Johnston 20205* (Ld).

TETRACLEA VISCIDA Lundell, Am. Midl. Nat. 29: 489--490. 1943.

Bibliography: C. L. Lundell, Am. Midl. Nat. 29: 489--490. 1943; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23 & 197. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 250. 1953; Mold., Résumé 28 & 470. 1959; Mold., Résumé Suppl. 3: 7. 1962; Mold. in *Correll & Johnston*, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Mold., Fifth Summ. 1: 57 & 63 (1971) and 2: 911. 1971; Mold., Phytol. Mem. 2: 50, 56, & 578. 1980.

An erect viscid annual herb, about 45 cm. tall, densely puberulent with gland-tipped hairs; stems and main branches drying reddish-purple; branchlets green, subterete; leaves decussate-opposite, sessile or subsessile; petioles if present not over 3 mm. long, margined; leaf-blades thickly chartaceous, probably fleshy when fresh, narrowly elliptic, 5--18 mm. long, to 9 mm. wide, broadest at the middle, apically acute, marginally entire, basally acute, glandular-puberulent on both surfaces, with some coarser eglandular hairs intermixed, 3-veined from the base; cymes axillary, pedunculate, 1- or 2-flowered; peduncles to 1 cm. long in the fruiting stage; pedicels not over 1 mm. long; the peduncles, pedicels, bracts, and calyx glandular-puberulent and sparsely hirsute with incurved hairs; calyx campanulate, 4- or 5-lobed, 8- or 10-veined, accrescent and to 8 mm. long in fruit, lobed to below the middle, the lobes lanceolate, attenuate to the acute apex; corolla apparently less than 5 mm. long but only known from the bud stage, the 4 outer lobes pubescent above the middle externally, the lower lobe with a line of hairs along the midvein; stamens 4, exserted; ovary apically shallowly 4-lobed; style apically bifid, the branches subulate, equal, reflexed; pyrenes small, hard, ob-ovoid, reticulate-rugose, attached only basally, apically minutely puberulent.

The type of this species was collected by Forrest Shreve (no. 9917) nineteen miles northwest of Uvalde, Uvalde County, Texas, at 1200 feet altitude, on September 11, 1940, and is deposited in the herbarium of the University of Michigan at Ann Arbor, Michigan.

Warnock describes the plant as "rare" in limestone soil of Travis County. It has been encountered at 400--1710 m. altitude, flowering and fruiting in September and October.

Material has been misidentified and distributed in some herbaria

as *T. coulteri* A. Gray and as *Scrophularia parviflora* Woot. & Standl.

Citations: TEXAS: Travis Co.: Albers & Haskell 49278 (Au--262712); Warnock 45-14 (Au--1659311). Uvalde Co.: Shreve 9917 (F--photo of type, Mi--type, N--isotype, N--photo of type, Sg--photo of type, Z--photo of type). ARIZONA: Gila Co.: Collom s.n. [Barnhart Pass] (Mi).

ADDITIONAL NOTES ON THE GENUS *VITEX* XVIII

Harold N. Moldenke

VITEX Tourn.

Additional & emended bibliography: Sandm. in L., Amoen. Acad. 5: 380. 1759; Neck., Elem. Bot. 1: 353. 1790; Roxb., Hort. Beng., imp. 1, 46 & [95]. 1814; Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541, fig. 1 & 2 (1819) and 3: 56. 1823; Loud., Hort. Brit., ed. 1, 246 & 529 (1830) and ed. 2, 246 & 529. 1832; Roxb., Fl. Ind., ed. 2, imp. 1, 3: 60--75. 1832; Blanco, Fl. Filip., ed. 3, 513--517. 1837; G. Don in Loud., Hort. Brit., ed. 3, 246 & 529. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 550--551. 1839; Endl., Gen. Pl. 2: 1501. 1841; A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 13: 185. 1849; Miq., Fl. Ind. Bat. Suppl. 1: 95, 242, & 567--568. 1860; Peters, Naturwiss. Reise Mossamb. 6 (1): Bot. 256 & 265--266. 1861; Ulrich, Internat. Wörterb., ed. 1, 254. 1871; Pritz., Thes. Lit. Bot., imp. 1, 245. 1872; Brandis, Forest Fl. Northw. Cent. India 369--370 & 577. 1874; Firminger, Man. Gard. India, ed. 3, 326 & 620. 1874; Pfeiffer, Nom. Bot. 1 (2): 1592--1593 & 1836 (1874), 2 (1): 24 & 25 (1874), and 2 (2): 1569, 1570, 1593, & 1605. 1874; Roxb., Fl. Ind., ed. 2, imp. 2, 481--483. 1874; Ulrich, Internat. Wörterb., ed. 2, 254. 1875; Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 6: pl. 226--228 & 427. 1878; Boiss., Fl. Orient., imp. 1, 4: 535. 1879; Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: 159--160. 1880; Franch., Pl. David., imp. 1, 1: 232. 1884; Hillebrand, Fl. Hawai. Isls., imp. 1, 340 & 342. 1888; Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 287, 296--297, & 371. 1888; Forbes & Hemsl., Journ. Linn Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 257--259. 1890; Baill., Hist. Pl. 11: 85--88, 94, 95, 110, 112, & 116, fig. 93--96. 1891; J. C. Willis, Dict. Flow. Pl., ed. 2, 604 & 608. 1903; Post & Kuntze, Lexicon 589 & 688. 1904; J. C. Willis, Dict. Flow. Pl., ed. 3, imp. 1, 621 & 625. 1908; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 2: 1021 & 1022. 1908; Stopes, Cat. Mesoz. Pl. 225. 1913; J. C. Willis, Dict. Flow. Pl., ed. 3, imp. 2, 621 & 625. 1914; Thonner, Flow. Pl. Afr. 470. 1915; R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Kong. Exped. Bot. 2 (2): 273--274. 1916; Saxton & Sedgewick, Rec. Bot. Surv. India 7: 291.

- 1918; E. D. Merr., *Bibl. Enum. Born. Pl.* 5: 513--515. 1921; J. C. Willis, *Dict. Flow. Pl.*, ed. 5, 678 & 682. 1925; Thakar, *Pl. Cutch.* 223. 1926; E. D. Merr., *Univ. Calif. Publ. Bot.* 15: 263 & 264. 1927; Ewart, *Fl. Vict.* 973. 1930; Funke, *Ann. Jard. Bot. Buitenz.* 41: 55. 1930; Marloth, *Fl. S. Afr.* 3: 146. 1932; A. W. Hill, *Ind. Kew. Suppl.* 8: 119. 1933; Junell, *Symb. Bot. Upsal* 1 (4): 93--94, 98, 132, 199--200, & 205. 1934; Bally, *Kew Bull. Misc. Inf.* 1937: 24. 1937; Stahl, *Estud. Fl. Puerto Rico*, ed. 2, 3: 287, 296--297, & 371. 1937; Fletcher, *Kew Bull. Misc. Inf.* 1937: 74 & 75 (1937) and 1938: 401, 405--409, & 431--437. 1938; Chun, *Sinensia* 4: 268. 1940; Kosterm., *Reinwardtia* 1: 75--80, 82, 84--90, 92--97, 99, 100, 102--104, & 106. 1951; J. C. Willis, *Dict. Flow. Pl.*, ed. 6, 678 & 682. 1951; Thakar, *Fl. Barda* 585. 1952; Patel, *Syst. List Trees* 20. 1953; Bean in Chittenden, *Dict. Gard.* 4, imp. 1, 2249 & 2250. 1956; G. Taylor, *Ind. Kew. Suppl.* 12: 141 & 151. 1959; Duthie, *Fl. Upper Gang. Pl.*, ed. 2, 2: 90. 1960; Turrill, *Curtis Bot. Mag.* 173: pl. 355 in textu. 1960; Santapau, *Journ. Gujarat Res. Soc.* 17: 39. 1962; Boiss., *Fl. Orient.*, imp. 2, 4: 535. 1964; Imbesi, *Ind. Piante* 129 & 704--705. 1964; Puri, Jain, Mukerjee, Sarup, & Kotwal, *Rec. Bot. Surv. India* 19: 107. 1964; Banerji, *Rec. Bot. Surv. India* 19: 75. 1965; Bean in Chittenden, *Dict. Gard.*, imp. 2, 4: 2245 & 2250. 1965; Airy Shaw in J. C. Willis, *Dict. Flow. Pl.*, ed. 7, 32, 40, 205, 245, 408, 409, 654, 687, 770, 932, 944, 1148, 1173, 1176, 1184, & 1188. 1966; Chavan & Oza, *Fl. Pavagadh* 187. 1966; Santapau, *Fl. Saurashtra* 41. 1966; Stafleu, *Tax. Lit.* 355--356. 1967; Franch., *Pl. David.*, imp. 2, 1: 232. 1970; Hatusima & Yoshinaga, *Bull. Fac. Agr. Kagosh. Univ.* 2: 93 & 109, pl. 15 (2 & 3). 1970; Patel, *Forest Fl. Gujarat* 25 & 230--231. 1971; Roxb., *Fl. Ind.*, ed. 2, imp. 3, 481--483. 1971; Pritz., *Thes. Lit. Bot.*, imp. 2, 245. 1972; Guinea Lopez & Ceballos Jimenez, *Elenco Fl. Vasc. Espan.* 202. 1974; Hocking, *Excerpt. Bot. A.* 23: 290, 291, & 389. 1974; Vitokumar, *Hindustani Times* Feb. 17, p. 4. 1974; Srivastava, *Fl. Gorak.* 259. 1976; Cramer, *Sri Lankan Forest.*, ser. 2, 13: 14. 1977; Ozenda, *Fl. Sahara*, ed. 2, 405--407. 1977; Ratter, Askew, Montgomery, & Gifford, *Revist. Bras. Bot.* 1: 51, 53, & 55. 1978; Dombrowski & Neto, *Inform. Pesq.* 3 (21): 80 & 81. 1979; Holm, Pancho, Herberger, & Plucknett, *Geogr. Atlas World Weeds* 385. 1979; Klein, *Sellowia* 31: 163. 1979; Kummrow, *Bol. Mus. Bot. Munic.* 38: 14. 1979; Li, Nan-fang 14, 100--103, & 168, fig. 29 & 30. 1979; Tans & Iltis, *Trans. Wisc. Acad. Sci.* 67: 79. 1979; Barcelo, *Fl. Mallorca* 4: [8]--10 & 33. 1980; Fosberg, *Otobed*, Sachet, Oliver, Powell, & Canfield, *Vasc. Pl. Palau* 38. 1980; Gentry, *Phytologia* 46: 209. 1980; Jayasuriya, *Stud. Fl. Ecol. Ritig.* 197--198. 1980; Liu & Yu, *Act. Bot. Yunnan.* 2: 455. 1980; Mold., *Phytologia* 46: 10--43, 57, 400, 464--494, 506, 510, & 512 (1980) and 47: 17, 18, 21, 22, 25, 28, 29, 31, 34, 38, 39, 41, & 42. 1980; Patunkar, *Grasses Marathwada* 10 & 297. 1980; Polunin, *Fls. Greece Balk.* 387 & 545. 1980; Rogerson & al., *Bull. Torrey Bot. Club* 107: 265. 1980; Roxb., *Hort. Beng.*, imp. 2, 46 & [95]. 1980; Seymour, *Phytol. Mem.* 1: 246. 1980; Strid, *Wild Fls. Mt. Olympus* 4 & [5], pl. 2, fig. 2. 1980; Vogel, *Seedl. Dicot.* 92,

106, & 465. 1980; Wiggins, Fl. Baja Calif. 535, fig. 503. 1980; Duncan & Kortesz, Vasc. Fl. Ga. 111. 1981; Hillebrand, Fl. Haw. Isls., imp. 2 [Cramer, Repr. U. S. Floras 9:] 340 & 342. 1981; Hocking, Phytologia 47: 484. 1981; Hu, Enum. Chin. Mat. Med. 18, 45, 69, 72, & 219. 1981; Mold., Phytologia 47: 331, 336, 355, & 512 (1981) and 48: 123, 124, & 291. 1981; Thomas & Allen, Contrib. Herb. North. La. Univ. 2: 38 & 42. 1981.

Brooker & Cooper (1961) assert that "The chemical constituents of *Vitex* species have been listed by Cambie (1959). The most notable is vitexin. The heartwood contains beta sitosterol.... while beta carotene and p-hydroxyl benzoic acid occur in the leaves. The methyl ester of this last component has been patented as a germicide (Extra Pharmacopoeia p. 104)."

The Peters (1861) reference in the literature of this genus is dated "1862" in error by Pritzel (1872).

The Commonwealth Institute Index of Fungi (1972) lists the following fungi as attacking *Vitex*: *Cercospora agarwalii*, *Exosporium viticis*, *Hormisciomyces bellus*, *Irenopsis viticifolii*, *Linochora viticis*, *Massaria kamatii*, *Phyllosticta ragatensis*, and *Zeta viticifolii*.

It is well worth noting here that Post & Kuntze (1904) divided the genus *Vitex* as follows:

Sect. 1. *Lagondium* (Rumpf) Kuntze [*Lagondium* Rumpf, 1743, *Euagnus* Schau., 1847]

Subsect. 1. *Mailelou* (Adans.) Kuntze [*Mailelou* Adans., 1763, *Agnus-castus* Endl., 1838, *Terminales* Briq., 1892]

Subsect. 2. *Limia* Endl. [*Axillares* Briq., 1892]

Subsect. 3. *Glomerovitex* Kuntze [*Glomerulosae* Briq., 1892]

Sect. 2. *Pyrostoma* (G. F. W. Mey.) Schau. [*Pyrostoma* G. F. W. Mey., 1818, *Casarettoa* Walp., 1844]

Sect. 3. *Chrysomallum* (Thouars) Schau.

Sect. 4. *Glossocalyx* G. B. Clarke

The *S. G. Beck* 1651, *Keel* S.33, *Liesner & González* 9451, *Miranda* 8471/26, and *Silva* 2820, distributed as *Vitex*, actually are not verbenaceous.

VITEX AGNUS-CASTUS L.

Additional synonymy: *Vitex argus-castus* Rawson, in herb.

Additional & emended bibliography: Poir. in Lam., *Encycl. Méth. Bot.* 3: pl. 541, fig. 1. 1819; Loud., *Hort. Brit.*, ed. 1, 246. 1830; Sweet, *Hort. Brit.*, ed. 2, 416. 1830; Loud., *Hort. Brit.*, ed. 2, 246. 1832; G. Don in Loud., *Hort. Brit.*, ed. 3, 246. 1839; G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Ulrich, *Internat. Wörterb.*, ed. 1, 254. 1871; Brandis, *Forest Fl. N.W. Cent. India* 370. 1874; Ulrich, *Internat. Wörterb.*, ed. 2, 254. 1875; Baill., *Hist. Pl.* 11: 85--86 & 94, fig. 93--96. 1891; D. H. Scott in *Solered.*, *Syst. Anat. Dicot.* [transl. Boodle & Fritsch] 1: 631 & 634 (1908) and 2: 1022. 1908; Kosterm., *Reinwardtia* 1: 78, 79, 100, & 106. 1951; Bean in Chittenden, *Dict. Gard.*, imp. 1, 4: 2249. 1956; Imbesi, *Ind. Piante* 129 & 704--705. 1964; Bean in Chittenden, *Dict. Gard.*, imp. 2, 4: 2249. 1965; Guinea Lopez & Ceballos Jimenez, *Elenco Fl. Vasc. Espan.* 202. 1974; Ozenda, *Fl.*

Sahara, ed. 2, [406] & 407, fig. 149. 1977; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 385. 1979; Barcelo, Fl. Mallorca 4: [8]--10. 1980; Mold., Phytologia 45: 479--480. 1980; Polunin, Fls. Greece Balk. 387. 1980; Strid, Wild Fls. My. Olympus 4, [5], & 298, pl. 2, fig. 2. 1980; Duncan & Kortesz, Vasc. Fl. Ga. 111. 1981; Thomas & Allen, Contrib. Herb. North. La. Univ. 2: 29 & 42. 1981.

Additional & emended illustrations: Poir. in Lam., Tabl. Encycl. Meth. Bot. 3: pl. 541, fig. 1, 1819; Baill., Hist. Pl. 11: 85, fig. 93--96. 1892; Ozenda, Fl. Sahara, ed. 2, [406], fig. 149. 1977; Barcelo, Fl. Mallorca 4: [8] & 33 (in color). 1980; Strid, Wild Fls. Mt. Olympus [5], pl. 2, fig. 2 (in color). 1980.

Butterwick & Lamb encountered this plant on a Texas floodplain and Fletcher found it growing along railroad tracks in Louisiana. The Hill collection, cited below, is from a plant cultivated in a Dioscorides garden and said to have been 6--8 feet tall with "lilac-purple" corollas. The *Braley s.n.* [3 Oct. 1968] and *Wroten 646*, cited below, bear no indications on their accompanying labels that they were gathered from cultivated plants, but I am assuming that they were. On the other hand, *Thomas & al. 33417*, collected in "lawn beside alley", may have been from cultivated material or possibly from naturalized ones.

Strid (1980) informs us that in the Mount Olympus area of Greece this species "forms a dense brush-wood on the dunes a short distance from the sea, often together with *Paliurus spina-christi*."

The *Liogier 16870*, distributed as typical *V. agnus-castus* L., actually represents *f. caerulea* (Rehd.) Mold., while *Dooley 488*, *Hamlin s.n.* [4-16-72], and *P. White 175 & s.n.* [3 July 1969] are *V. negundo* L.

Additional citations: MARYLAND: Montgomery Co.: *Rawson s.n.* [Silver Spring, July 1, 1969] (W--2010020). NORTH CAROLINA: Rockingham Co.: *Leonard & Russ 2562* (Ne--33950). LOUISIANA: Caddo Par.: *Overby 368* (Ne--115767). Caldwell Par.: *Shell 127* (Ne--33944); *Thomas, Marx, & al. 66421* (Ne--160982). Concordia Par.: *Lindley & Lindley s.n.* [23 May 1976] (Ne--123459). Franklin Par.: *D. Dixon 3735* (Ne--176021); *W. Fletcher 158* (Ne--152166). Ouachita Par.: *P. Johnson s.n.* [11/10/68] (Ne--13750); *Scarborough 749* (Ne--33947); *Thomas & al. 33417* (Ne--65401). Winn Par.: *P. W. Parker s.n.* [17 July 1971] (Ne--33941). TEXAS: Cameron Co.: *Crow s.n.* [15 August 1969] (Ne--33951). Llano Co.: *Butterwick & Lamb 2890* (Au). Van Zandt Co.: *R. D. Thomas 25104* (Ne--66811). VIRGIN ISLANDS: St. Croix: *Ørsted s.n.* (N). CULTIVATED: District of Columbia: *S. R. Hill 9708* (N). Florida: *P. O. Schallert 365* (Go). Louisiana: *Braley s.n.* [3 Oct. 1968] (Ne--33946); *Lieux 135* (Ne--33945); *Wroten 646* (Ne--33948). Texas: *Bratz s.n.* [Elkhart, 8/30/61] (N).

VITEX AGNUS-CASTUS f. ALBA (West.) Rehd.

Additional synonymy: *Vitex agnus-castus* var. *albiflorus* Palau-Ferrer ex Barcelo, Fl. Mallorca 4: 9. 1980.

Additional & emended bibliography: Bean in Chittenden, Dict. Gard., imp. 1, 4: 2249 (1956) and imp. 2, 4: 2249. 1965; Mold., Phytologia 44: 340--341. 1979; Barcelo, Fl. Mallorca 4: 9. 1980;

Mold., Phytol. Mem. 2: 24, 54, 195, 197, 198, 255, 366, 456, 457, & 588. 1980.

Barcelo (1980) reports this form of the species from Majorca.

VITEX AGNUS-CASTUS f. *CAERULEA* (Rehd.) Mold.

Additional bibliography: Mold., Phytologia 44: 341. 1979; Mold., Phytol. Mem. 2: 54, 54, 96, 181, 196--198, 366, 456, 457, & 588. 1980.

Liogier describes this plant as shrubby, 1.5 m. tall, branched from the base, with blue "flowers" [corollas], and found it naturalized in thickets near the seashore in the Dominican Republic, flowering in November.

Additional citations: HISPANIOLA: Dominican Republic: A. H. Liogier 16870 (N).

VITEX AGNUS-CASTUS var. *DIVERSIFOLIA* (Carr.) Schelle

Additional bibliography: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541, fig. 2. 1819; Mold., Phytologia 44: 338 & 342. 1979; Mold., Phytol. Mem. 2: 366, 456, 458, & 588. 1980.

Additional illustrations: Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541, fig. 2. 1819.

VITEX AGNUS-CASTUS f. *LATIFOLIA* (Mill.) Rehd.

Additional & emended bibliography: Loud., Hort. Brit., ed. 1, 246 (1830) and ed. 2, 246. 1832; G. Don in Loud., Hort. Brit., ed. 3, 246. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Mold., Phytologia 44: 338, 339, & 342--344. 1979; Mold., Phytol. Mem. 2: 19, 21, 43, 195--199, 254, 255, 366, 369, 456, 457, & 588. 1980.

Additional citations: CULTIVATED: North Carolina: J. F. Matthews s.n. [July 1, 1974] (Ne--114122).

VITEX AGNUS-CASTUS var. *PSEUDO-NEGUNDO* Hausskn.

Additional bibliography: Mold., Phytologia 45: 480. 1980; Mold., Phytol. Mem. 2: 198, 200, 254--256, 366, 456--459, & 588. 1980.

Recent collectors have encountered this plant in dry riverbeds in deserts and semideserts, at 2700 feet altitude, describing it as 1 m. tall. The corollas are said to have been "blue" on Andersen & Petersen 443.

Additional citations: AFGHANISTAN: Andersen & Petersen 443 (Go); Noel 30 (Go).

VITEX ALTISSIMA L. f.

Additional synonymy: *Vitex altissima* f. *altissima* Mold. ex Jayasuriya, Stud. Fl. Ecol. Ritig. 197. 1980.

Additional & emended bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; Loud., Hort. Brit., ed. 1, 246 (1830) and ed. 2, 246. 1832; Roxb., Fl. Ind., ed. 2, imp. 1, 3: 71--72. 1832; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Roxb., Fl. Ind., ed. 2, imp. 2, 482. 1874; Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 6: pl. 227 (1878) and ed. 3, 4: 160. 1880; Roxb., Fl. Ind., ed. 2, imp. 3, 482. 1971; Jayasuriya, Stud. Fl. Ecol. Ritig. 197--198.

1980; Mold., Phytol. Mem. 2: 265, 269, 271, 290, 318, 327, 366, 422, 456, 459, 460, & 588. 1980; Mold., Phytologia 45: 480. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980.

Additional illustrations: Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 6: pl. 227. 1878.

Jayasuriya (1980) describes this species as a small to large, deciduous, stocky tree, the trunk to 1.6 m. in diameter at breast height, frequent in all the lowlands of Sri Lanka, flowering from June to October, and called "kaha milla", "milla", "miyan-milla", and "niyan milla". He cites Huber 403 and Jayasuriya 1262 from Sri Lanka.

VITEX ALTISSIMA f. juv. *ALATA* (Willd.) Mold.

Additional & emended bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Mold., Phytologia 45: 480. 1980; Mold., Phytol. Mem. 2: 265, 269, 318, 366, 457, 460, & 588. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980.

Ripley refers to this plant as a "common tree" in sandy soil, at 61 m. altitude, and his collection was gathered as voucher in primate studies conducted by him in Sri Lanka. It consists of sapling (sterile) leaves on which the petiolar wings are just as narrow as they are on *Nooteboom 3204*, which is in fruit.

Additional citations: SRI LANKA: Ripley 246 (W--2942594).

VITEX ALTISSIMA f. *SUBGLABRA* Thwaites

Additional bibliography: Mold., Phytologia 45: 480. 1980; Mold., Phytol. Mem. 2: 269, 366, 457, & 588. 1980.

Recent collectors describe this plant as a tree, 15--30 m. tall, the trunk 20--40 cm. in diameter at breast height, and encountered it in primary and wet evergreen forests and the edges of rainforests, at 150--900 m. altitude, flowering from August to October, and fruiting from September to November.

The corollas are said to have been "lavender" on Huber 345 & 403, "pale-violet" on Kostermans 26727, and "blue" on *Nooteboom 3204* and *Nooteboom & Huber 3153*. *Nooteboom 3204* exhibits leaves whose petioles have definite narrow wings although the specimen bears immature green fruit. On *Kostermans 26727* some of the leaves are galled. Kostermans reports the species "very common" in rather dry valleys, while *Nooteboom* notes that its wood is "firstclass for window-frames". The reported local name for the tree is "mille".

Additional citations: SRI LANKA: Huber 345 (W--2941747), 403 (W--2941670); Kostermans 26727 (W--2868166), 27150 (Ac); *Nooteboom 3204* (W--2890921); *Nooteboom & Huber 3153* (W--2832979).

VITEX AMBONIENSIS Glurke

Additional bibliography: Bally, Kew Bull. Misc. Inf. 1937: 24. 1937; Mold., Phytologia 44: 385--386 & 390 (1979) and 45: 480. 1980; Mold., Phytol. Mem. 2: 224, 228, 231, 234, 236, 238, 241, 246, 366, & 588. 1980.

Bally (1937) records the vernacular name, "mtalali", for this species and asserts that the whole plant is used by the Swahili

to make an antidote for snakebite venom.

VITEX BOGALENSIS Wernham

Additional bibliography: Mold., *Phytologia* 44: 391--392. 1979; Mold., *Phytol. Mem.* 2: 214 & 588. 1980.

Additional citations: CAMEROONS: *Talbot 1046* [Mo. Bot. Gard. photo A.856 in part] (Go--photo of type, Z--photo of type).

VITEX BULUSANENSIS Elm.

Additional bibliography: Mold., *Phytologia* 44: 393 (1979) and 46: 466. 1980; Mold., *Phytol. Mem.* 2: 309 & 589. 1980.

It seems very probable that, when more material is available, this taxon may prove to be a member of the genus *Teijsmanniodendron*.

VITEX CAESPITOSA Exell

Additional bibliography: Mold., *Phytologia* 44: 394--395. 1979; Mold., *Phytol. Mem.* 2: 234 & 589. 1980.

Additional citations: ANGOLA: Luanda: *Gossweiler 3302* [Mo. Bot. Gard. photo A.8571] (Go--photo of type, Z--photo of type).

VITEX CALOTHYRSA Sandw.

Additional bibliography: Mold., *Phytologia* 45: 481. 1980; Mold., *Phytol. Mem.* 2: 121, 123, 125, 171, 457, & 589. 1980.

Recent collectors describe this plant as a tree, 3--15 m. tall, and have encountered it in forests, at 120 m. altitude, in flower in April and July, and in immature green fruit in July. The corollas on *Liesner 6985* are described as having been "white with a bluish tint and with a yellow patch on the lower lip" and on *Alencar 575* as "rose, the buds lilac".

Material of this species has been misidentified and distributed in some herbaria as *Bignoniaceae*.

Additional citations: BRAZIL: Amazonas: *Alencar 575* (Ld, N), 576 (Ld, N); *Liesner 6985* (Ld).

VITEX CANESCENS Kurz

Additional & emended bibliography: Fletcher, *Kew Bull. Misc. Inf.* 1938: 405, 431, & 433--434. 1938; Mold., *Phytologia* 44: 395--396. 1979; Mold., *Phytol. Mem.* 2: 266, 274, 280, 282, 287, 289, 290, 294, 327, 366, 458, & 589. 1980.

VITEX CAPITATA Vahl

Additional & emended bibliography: G. Don in Sweet, *Hort. Brit.*, ed. 3, 551. 1839; Mold., *Phytologia* 45: 481 (1980) and 46: 35. 1980; Mold., *Phytol. Mem.* 2: 104, 112, 121, 125, 171, 366, 430, 457, 460, & 589. 1980.

Recent collectors describe this species as a shrub, 2 m. tall, or a tree, 4--6 m. tall, the flowers visited by numerous bees, the mature fruit red, and have found it growing in disturbed sandy soil, at 140--900 m. altitude, flowering in February and April, in fruit in March. The corollas are said to have been "blue" on *Gentry & al. 11148* and "blue with white nectar-guides" on *Davidse & González 15628*.
[to be continued]

NOTAS SOBRE RUBIACEAE

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Durante la preparación de las Rubiáceas para el *Catálogo Ilustrado de las Plantas de Cundinamarca*, Colombia, tuve la oportunidad de examinar algunas colecciones y tipos del género *Palicourea*. Las especies están muy mezcladas, lo cual, dificulta el estudio taxonómico. Gran parte es debido a las muchas especies descritas como nuevas sin tener en cuenta las variaciones que se presentan dentro de las poblaciones. A continuación presento algunos cambios taxonómicos:

1. *PALICOUREA VAGINATA* Benth., Pl. hartw. 193. 1845.

Tipo: *Hartweg 192* (holotipo K!), Cordillera de los Andes, Bogotá, Departamento de Cundinamarca, Colombia.

Sinónimo: *Palicourea vagans* Wernh., J. Bot. 55: 281. 1917.

Tipo: *Triana 131* (lectotipo K, n.v.; isolectotipo US!), La Baja, Departamento de Santander, Colombia.

2. *PALICOUREA ANCEPS* Standl., Publ. Field Columbian Mus., Bot. Ser. 7(1): 119. 1930.

Tipo: *F. W. Pennell & E. P. Killip 6606* (holotipo US!; isotipos GH, NY, n.v.), 11-13 Jun 1922, Puracé, Departamento de Valle del Cauca, Colombia.

Sinónimo: *Palicourea lopeziana* Standl. ex Steyererm., Act. Biol. Venez. 4(1): 73. 1964.

Tipo: *J. Cuatrecasas 18872* (holotipo US!; isotipos F, VEN, n.v.), 2 dec 1944, Alto del Duende, Departamento de Valle del Cauca, Colombia.

3. *PALICOUREA IONANTHA* Standl., Publ. Field Columbian

Mus., Bot. Ser. 7(1): 133. 1930.

Tipo: *F. W. Pennell 2424* (holotipo US!; isotipo NY, n.v.), 13 Oct 1917, El Peñon, southwest of Sibate, Departamento de Cundinamarca, Colombia.

Sinónimo: *Palicourea albert-smithii* Standl., Publ. Field Columbian Mus., Bot. Ser. 7(1): 118. 1930.

Tipo: *E. P. Killip & A. C. Smith 20700* (holotipo US!; isotipo NY, n.v.), 12-13 Mar 1927, Páramo del Hatico, Departamento de Norte de Santander, Colombia.

4. *PALICOUREA LINEARIFLORA* Wernh., J. Bot. 55: 280. 1917.

Tipo: *Triana 1639 (3146.1 bis)* (lectotipo BM!; isoelectotipo US 1480993), Llanos de San Martin, 450 mt, Departamento de Meta, Colombia. (Figs. 1 y 2)

Sinónimos: *Palicourea effusa*., Publ. Field Columbian Mus., Bot. Ser. 7(1): 131. 1930.

Tipo: *E. P. Killip & A. C. Smith 20562* (holotipo US!; isotipo NY, n.v.), 12 Mar 1927, Páramo Hatico, from Toledo to Pamplona, Departamento de Norte de Santander, Colombia.

Palicourea boyacana Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 22(3): 194. 1940.

Tipo: *A. E. Lawrence 154* (holotipo F, n.v.; isotipo US!), 3 Jun 1932, Mount Chapon, extreme western part of Departamento de Boyacá, Colombia.

En la descripción original de *P. lineariflora*, dos colecciones, *Triana 1639* y *Triana 77*, fueron citadas. En US existen dos ejemplares de *Triana 1639* los cuales representan dos especies diferentes. El ejemplar de US número 1480993 es *P. lineariflora* Wernh., como ha sido utilizado tradicionalmente por

Standley (1930). El ejemplar de US número 1480992 es *P. crocea* Sw.

Standley (1930) seleccionó el ejemplar *Triana 1639* de K como "tipo". De acuerdo a las reglas de nomenclatura, esto fué una lectotipificación. Una fotografía del lectotipo *Triana 1639* fué enviada de K. La anotación que en ella aparece es de Standley y no de Wernham. Es sin duda *P. lineariflora*. El artículo 7.5 del *International Code of Botanical Nomenclature* (Stafleu et al., 1978), cita lo siguiente: "A lectotype is a specimen or other element selected from the original material to serve as a nomenclatural type when no holotype was designated at the time of publication or as long as it is missing ...". En la misma edición en "Guide for the determination of types", se encuentra la siguiente citación: "a. A lectotype must be chosen from among elements that were definitely studied by the author up to the time the name of the taxon was published and included in the protologue". Ya que Wernham no anotó ni citó el material de K, éste, no hace parte del original. Por consiguiente el lectotipo seleccionado por Standley no puede ser aceptado.

Para clarificar las dudas respecto a la tipificación, el ejemplar *Triana 1639*, depositado en el BM fué pedido en préstamo. La exicata recibida contiene las dos colecciones, *Triana 1639* y *Triana 77*, montadas en la misma cartulina; la anotación que en ella aparece es de Wernham. Las inflorescencias en los dos ejemplares son tricótomas, sub-umbeladas y laxas (Figs. 1 y 2). Son por tanto representantes de *P. lineariflora*.

Estoy seleccionando el ejemplar *Triana 1639* que está en la parte superior derecha de la exicata del BM como el lectotipo de *P. lineariflora* Wernh. *Triana 77* es el lectoparatipo.

Aunque *Triana 2639* es una colección mezclada, he seleccionado este número como lectotipo, ya que, se encuentra en el sistema de numeración de la colección de Triana. Una explicación breve es necesaria para entender la historia de las colecciones del gran sabio. Triana arregló sus colecciones sistemáticamente de acuerdo al sistema de Endlicher (1836-1841). Esta numeración está en un catálogo autobiográfico depositado en la biblioteca del British Museum (Natural History) de Londres (Wurdack, 1971; Kirkbride, 1979). Mas tarde, probablemente en París, los números

de colección fueron adicionados al catálogo. Los duplicados distribuidos a los herbarios europeos tienen los números de la colección, en tanto que, aquellos ejemplares de COL tienen la numeración sistemática. Para obviar problemas con esta doble numeración, citaciones de las colecciones de Triana deben tener los dos números si es posible. De acuerdo al catálogo, el número alternativo de *Triana 1639* es *3146.1 bis*. El primer número es el de colección y aparece en las exicatas de los herbarios europeos, el otro es aquel del sistema de Endlicher.

Decidí no seleccionar *Triana 77* como lectotipo, pues no se encuentra en el sistema de numeración de Triana. Es factible que ese haya sido un número asignado temporariamente. Otra posibilidad ha sido sugerida por Miss Sylvia Gould, British Museum (Natural History)(com. pers.), ella piensa que los primeros números de Triana son en realidad colecciones de Linden que fueron depositados en el herbario de Triana, sin indicar el colector.

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Fig. 1. Excicata del BM con una planta de *Triana 1639* en la parte superior derecha, lectotipo de *Palicourea lineariflora* Wernh., y dos plantas de *Triana 77* en la parte izquierda, lectoparatipo de *P. lineariflora*.



Fig. 2. Inflorescencia de *Triana 1889*, lectotipo de *Pulicourea lineariflora* Wernh. del BM.

CYPRIPEDIUM KENTUCKIENSE REED,

A NEW SPECIES OF ORCHID IN KENTUCKY

Clyde F. Reed

For over thirty years I have seen or heard of a white lady's-slipper in mesophytic wood of the Cumberland Plateau of Eastern Kentucky. I first saw it being grown in a garden in Morehead (Rowan Co.) in 1948. The original plants had come from Elliott County. Later I found it in Carter County and other specimens were collected in Rowan County. Students reported it to me from Menifee and Estill Counties. Most recently in 1980 I was told of its being in Rockcastle County.

Since the specimens at hand do not fit any description of a native species of Cypripedium in Luer's 'Orchids of North America,' these plants are described below as a new species.

Cypripedium kentuckiense Reed, sp. nov.

Planta 6-7 dm. alta; caules pubescentes; folia fere 5, omnes in caulibus, late-ovata, sessiles, 14-16 cm. longa, 6-8 cm. lata, gradatim a medio ad obtortum apicem, cum 7 prominentibus venis, subglabris et pubescentibus secundum venas subtus; flora terminalis, singularis, alba vel pallida flos-lacte-alba, 15 cm. lata, subtenta sessile folio 8 cm. longo et 2.8 cm. lato, saccata petalis 5 cm. longa, 3.5 cm. lata, supra petalis 6.8 cm. longa, 3.2 cm. lata, 2 laterales petales 8 cm. longae, 0.7 cm. latae, inferior petalis 5.7 cm. longa, 1.2 cm. lata; capsula 6 cm. longa, 1.3 cm. lata.

Typus: Plants originally from Elliott Co.; Kentucky, raised in Morehead, Rowan Co., Ky. May 28, 1948. Reed 18141 (fl., illus.); Co-typus: rocky deep ravine 1 mile E of Gesling, Carter Co., Ky. Nov. 25, 1948. Reed 14476 (fr., illus.).

Other specimens at hand: Low woods along North Fork, Rowan Co., Ky. May 26, 1950. Charles Cain 99 (fl.). (Reed Herb. 41323).

The plants and flowers of C. kentuckiense Reed are much larger than those of C. calceolus. Also the flowers are white to nearly pale creamy-white. Plants are 6-7 dm. tall; stems finely pubescent; leaves usually 5, broadly ovate, 14-16 cm. long, 6-8 cm. broad, tapering gradually from the middle to the slightly twisted apex, with 7 prominent veins, subglabrous with some pubescence along the veins beneath; flowers solitary, terminal,

white or very pale creamy white, quite large, 15 cm. across, subtended by a smaller sessile leaf 8 cm. long and 2.8 cm. broad, the sacrate petal 5 cm. long, 3.5 cm. across, the upper petal 6.8 cm. long, 3.2 cm. across, the 2 lateral petals 8 cm. long, 0.7 cm. broad, the lower petal 5.7 cm. long, 1.3 cm. broad; capsule 6 cm. long, 1.3 cm. broad. Flowering in late May; fruiting in October-November.

Native to the mesophytic woods, mainly in deep ravines on acid sandstone soils of the Cumberland Plateau or Peneplain of Eastern Kentucky, at least from Carter and Rowan Counties south to Estill and Rockcastle Counties.

Legend for picture

Cypripedium kentuckiense Reed. A. Top half of plant showing flower, leaf at base of flower and three cauline leaves; B. Capsule, with persistent basal floral leaf. All X 1/2.



BOOK REVIEWS

Alma L. Moldenke

"PHYCOLOGY" by Robert Edward Lee, xi & 478 pp., 269 b/w fig., 22 photos. & 2 tab., Cambridge University Press, Cambridge CB2 1RP, England, and New York, N. Y. 10022. \$49.50 cloth-bound, \$16.95 paperbound.

Because this text is so well prepared it is fortunate that it is available not only at the deserved high price for the cloth-covered form which libraries, professors and scientists will purchase but also at the very reasonable one-third price for the paperback form which undergraduates can meet and yet have an unusually fine and thorough study guide. Developments in electron microscopy, biochemistry, genetical cell studies and ecology affecting algae are incorporated into the text. The algae are arranged by families in their respective classes with many helpful drawings, photographs and text.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY Volume 31" edited by Winslow R. Briggs et al., v & 724 pp. & 66 b/w fig., 10 photo. & 23 tab. Annual Reviews Inc., Palo Alto, California 94306. 1980. \$20.00 U.S.A. & \$21.00 foreign.

Over the years this and other series familiar to different kinds of botanists and biologists have maintained or enhanced their quality. Anton Lang, in the prefatory chapter, writes very interestingly of his early life in the Polish Corridor, Russia, Nazi Germany, Canada and the U.S.A. and of his professional life, especially on florigens and flowering hormone inhibitors, mostly "done with simple, well-established techniques - varying photoperiod and temperature, grafting, and the like -A technique is useful only as long as it is applicable to the given problem."

Efficiency of symbiotic N_2 -fixing organisms in legumes explains the progress and shows the stumbling-blocks in pertinent research. It is also done for plastid replication, including non-green ones, organogenesis, phloem translocation, partitioning of N_2 solutes. The last important paper is on the Evolution of Biochemical Pathways. Excellent reading.

"ANNUAL REVIEW OF ECOLOGY AND SYSTEMATICS" Volume 11, edited by Richard F. Johnston et al., xi & 487 pp., 22 b/w fig., 13 tab., & 1 map. Annual Reviews Inc., Palo Alto, California 94306. 1980. \$20.00 in U.S.A., \$21 foreign.

This series has a wider appeal than many of the others - to all kinds of botanists, zoologists, biologists in the lecture chair and/or in the laboratory and/or in the field. To indicate some of the range of topics there is Bawa's evolutionary treatment of dioecy in which he concludes that it is "more than a simple mechanism to promote outcrossing....Sexual dimorphism changes the spatial distribution of resources for pollinators, seed dispersers, and predators". Price et al. consider "all terrestrial communities based on living plants are composed of at least three interacting trophic levels: plants, herbivores, and natural enemies of herbivores." Chapin provides an effectively prepared chart comparing "interacting characteristics of plant strategies that are adaptive under conditions of high or low nutrient availability." Watts corrects and brings up to date information on the late Quaternary vegetation history of the southeastern United States. Antonovics and Levin consider such density-dependent regulators as interspecific competition, predators and pathogens, pollinators, and gene flow. All these and the other topics covered in the book are carefully treated.

"HOW TO KNOW THE GRASSES" Third Edition by Richard W. Pohl, viii & 200 pp., 433 b/w line draw. fig. William C. Brown Company Publishers, Dubuque, Iowa 52001. 1978. \$8.95 spiral-bound, papercovered.

This useful member of the long reliable Pictured Key Nature Series is a recent revision that "includes keys and illustrations for 324 of the most common and important American grasses - those that the beginner is most likely to encounter, including those of importance in farming, gardening, weed control, and range and pasture management.....124 others are mentioned in connection with closely related species, and their distinguishing features are pointed out."

"HOW TO KNOW THE AQUATIC PLANTS" Second Edition by G. W. Prescott, viii & 158 pp. & 229 line draw. fig. William C. Brown Company Publishers, Dubuque, Iowa 52001. 1980. \$8.95 spiral-bound, paper-covered.

This revised and enlarged new edition in the Pictured Key Nature Series is well prepared for the amateur naturalist with its introductory notes on the uses of aquatics, their ecological relationships, methods of collecting, and use of the clear-cut key to 165 genera. The illustrations in this edition are larger and much clearer than those of the smaller-sized first edition.

"LABORATORY MANUAL OF GENERAL ECOLOGY" Fourth Edition by George W. Cox, vii & 237 pp., 68 b/w tab. & 12 fig. William C. Brown Company Publishers, Dubuque, Iowa 52001. 1980. \$8.95 spiral-bound, paper-covered.

For a regular undergraduate ecology or environmental science course, or a teacher training one or an honors high school group, this text provides good guidance and wide choice for class, small team or individual activities. A few of the 40 topics are: vegetation analysis by quadrat sampling or plotless sampling or Bitterlich variable radius technique, ecotype differentiation, intrapopulation dispersion, population growth and limitation, pollination ecology, allelopathy in higher plants. Neither this manual nor any other equally well prepared field guide should be substituted for an excellent text, but should be used to supplement it.

"HOW TO KNOW THE SEED PLANTS" by Arthur Cronquist, vii & 153 pp., 337 line draw. fig. William C. Brown Company Publishers, Dubuque, Iowa 52001. 1979. \$8.95 spiral-bound paper-covered.

This excellently prepared member of the Pictured Key Nature Series has its emphasis "placed on plants that grow wild in the United States, or that are frequently cultivated there. The larger or economically important or botanically especially interesting families from outside the United States are also included to round out the picture." This text is a complete rewrite of the pertinent part of the old Jaques' "Plant Families: How to Know Them" and its illustrations are about half from Jaques, some from the "Manual of the Vascular Flora of the Carolinas" and the balance prepared especially for this book. The explanation of the principles of classification and nomenclature is the clearest one I have ever read for beginning students and/or amateurs. The keys certainly work facilely. Learn to recognize the 35 most abundant and conspicuous families in the continental United States "without using the keys, and you will know the family of the vast majority of the flowering plants you see growing wild in the United States." Helpful encouragement, indeed.

"PROPAGATE YOUR OWN PLANTS" by Wilma Roberts James & Arla Lipps-meyer, 149 pp. & 130 gr/w line draw. Naturegraph Publishers, Inc., P. O. Box 1075, Happy Camp, California 96039. 1978. \$8.50 clothbound, \$4.50 paperbound.

This is a pleasant little book with directions for helping one to enjoy more of one's plants and quite inexpensively. Part I gives clearcut directions for care, for rooting media and for means of propagation by cuttings of leaf, root, and various types of

stems, by runners, by layering, by rhizomes, by suckers and by division. Part II lists almost 100 individual plants alphabetically, gives their common and scientific names, their origins, and describes their appearance, special uses, culture and propagation. The first author writes the text and the second provides the attractive illustrations.

"STRATEGIES FOR THE CONTROL OF CEREAL DISEASE" edited for the Federation of British Plant Pathologists by J. F. Jenky & R. T. Plumb, x & 219 pp., 48 b/w tab., 9 fig., 5 photo., & 1 map. Blackwell Scientific Publications, Oxford, London, Edinburgh, & Halsted Press of John Wiley & Sons, Inc., New York, N. Y. 10017. 1981. \$47.50.

This useful but expensive book is produced by offset printing of very neatly typed papers presented for the 75th Anniversary of the Association of Applied Biologists at its international symposium. "The three sections...deal with host resistance, chemical control and husbandry". A few of the topics discussed in the first section are: multiline concept in theory and practice and durable disease resistance; in the second section: strategies for avoiding resistance to fungicides; and in the third section: cropping systems in relation to soil-borne and trash-borne diseases of cereals, and disease management in high-input cereal growing. The wheat, oats, barley, rye and corn are temperate zone grains but the techniques are applicable to the tropics and to other crops.

"ANIMALS, FEED, FOOD AND PEOPLE - An Analysis of the Role of Animals in Food Production" edited by R. L. Baldwin, xvi & 149 pp., 45 b/w tab. & 23 fig. Westview Press, Boulder, Colorado 80301. 1980. \$15.00.

This important publication No. 42 is composed of the seven offset papers presented at the American Association for the Advancement of Science Selected Symposium on Agriculture. The important measurings of people expansion, of arable land proportional shrinkage, of livestock being fed grain consumable by humans, especially in developing countries, seem reasonably accurate for settling many well intentioned arguments. To wit: A stable feedgrain sector may be the "most important factor required to stabilize the livestock sector". "As we view the world situation, we find only a small percentage of domestic animals, about 1.5 percent, 'competing' with humans for resources. The vast majority, quite to the contrary, exist symbiotically and provide man's only means of deriving life-sustaining products. In addition to converting inedible products into high quality protein, animals provide countless non-food uses."

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DICERANDRA RADFORDIANA, A NEW LABIATE FROM GEORGIA

Robin B. Huck

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Chapel Hill, North Carolina 27514

Continuing study of *Dicerandra* (Labiatae), oriented toward a revision of the genus, has revealed a second undescribed species in this small group of southeastern coastal plain endemics. Following the pattern of highly localized distribution of other species of this taxon (Huck, 1981), *Dicerandra radfordiana* has thus far been found only along the banks of the Altamaha River, McIntosh County, Georgia, in mesic woods. It is named in honor of Albert E. Radford, Professor of Botany, University of North Carolina, Chapel Hill, in recognition of his floristic and eco-systematic work in the southeastern United States.

Dicerandra radfordiana, sp. nov.

Planta annua herbacea usque ad 0.65 m altam sed saepe brevior. Caulis erectus ramis rarioribus, foliis oppositis petiolatis anguste oblongus, 40 (19-55) mm longis, 4 (2-6) mm latis, marginibus integris vel dentibus paucis in foliis inferioribus. Folia axillaria dimidia vel parviora quam folia primaria quae foveis glandiferis sunt. Inflorescentia verticillaster est, cymis minime pedunculatis, pedicellis florum 1-3 mm longis. Calyx plus minusve cylindraceus ore bilabiato, labio postico arcuato bisubulato crista hispida in quoque segmento, labio antico minute tridentibus distaliter e quoque dente laterali crista hispida recessim crescenti, inter alas divergentes depressione scutiformi effecta. Calyx 13-nervatus, 12 (8-15) mm longus, 3 (2.2-5.0) mm diametro ad medium, margine ciliato et hyalino vel roseo vel purpurascens, parte exteriori glanduloso-foveolato, parte interiori annulo pilorum, pilis appressis leniter flexuosis et 4 mm sub ore affixo. Corolla bilabiata, 32 (27-44) mm longa tubo 25 (20-32) mm longo, dilata vel media purpureo-rosca, limbo inferiore trilobo et tubo punctis atropurpureis et aliquot maculis flavis notata, limbo superiore leniter cuculliformi. Stamina epicorollina bijugata, antheris purpureis et nectariferis appendice corniculata in quoque theca in ovari per anthesin descendenti et basi cornu rima dehiscens. Pollen luteolum vel eburneum. Gynoecium singulare, stigmate furcati, stylo gracili, ovario bicarpellis loculi carpellorum in locellis ovoides duo divisi in rostro nectarifero oreuliformi inserto. Nuculae laeves brunnearum ovoides 1.2 mm diametra. Radix saepe malformata ob insecta penitus. Odor plantae cinnameus. Specimen typicum: Georgia: McIntosh County, Fort Barrington, on high bank of Altamaha River, at end of Bartram trail, 3.7 mi from GA 25 at Cox, *Quercus virginiana* woods, shell fragments in soil, Sept. 20, 1979, R. B. Huck 2181 legit. (in hb

NCU conservatum). Paratypes: McIntosh County, sandy bluff at Ft. Barrington on the Altamaha River upstream from Darien, coastal plain province, Sept. 18, 1961, Wayne R. Faircloth 7029 (VSC 14952!); McIntosh County, in vicinity of sand ridge along Altamaha River, live oak woods n. of graveyard near powerline on Wesley Lake Rd., October 7, 1962, Bozeman 2202 (NCU 270468!; GA 94393).

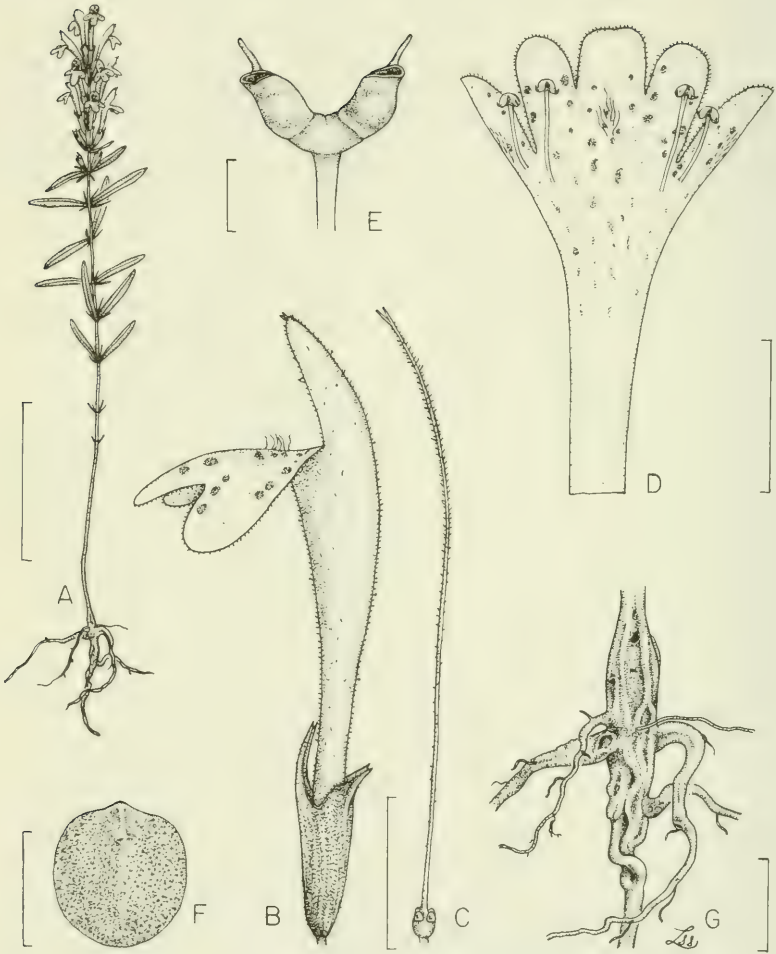
Annual to 0.65 m tall, but usually shorter. Stem erect, simple, rarely branched, surface with a moderate cover of falcate white hairs. Leaves narrowly oblong, 40 (19-55) mm long, 4 (2-6) mm wide, epetiolate. Axillary leaves one-half or less the length of primary leaves. Leaf margins entire, lower ones occasionally dentate. Leaf surface glandular-pitted, hispidulous. Inflorescence a verticillaster, cymes very short-pedunculate, flowers with pedicels 1-3 mm long. Calyx bilobed, the inferior lobe divided into two arcuate crested subuli, the superior lobe terminated in three minute teeth, the two lateral teeth traversed by main veins which become strongly winged, bowed ribs anteriorly, creating a spoon-shaped depression on the adaxial side. Calyx length 12 (8-15) mm; width at midpoint 3 (2.2-5.0) mm; Calyx with 13 prominent hispid ribs, surface glandular-pitted between; margin ciliate with a hyaline to pink or purple border and interior with a band of 1 mm-long flexuous hairs inserted 4 mm below the mouth. Corolla bilabiate, 32 (27-44) mm long, parting distally into a superior cuculliform limb and an inferior tripartite limb; tube 25 (20-32) mm long. Corolla surface glandular with tiny yellow, resin-like dots and puberulent with white glandular, often stipitate, hairs. Corolla tube glandular-hairy within, one-third of way from base. Upper limb of corolla with an internal isolated lanate patch, lower limb sparsely villous. Corolla light to medium purplish-pink spotted with dark purple dots and occasional yellow splotches. Exposed corolla of flower bud dark pink. Stamens four, epipetalous, one pair even with or barely exceeding upper lip margin, the other, inserted 2 mm below. Anther sacs purple and nectariferous, with corniculate appendages, the points of which are deflected downward into the corolla mouth at anthesis; dehiscence by means of slits at the base of appendages on dorsal side of anther. Pollen pale yellow to yellowish-white. Pistil with a slender style covered distally by antrose or perpendicular, often aristate, hairs. Style exerted from the corolla along a canaliculate track in keel of superior limb, terminating in a subequal bifid stigma. Ovary four-segmented, embedded in a nectariferous barrel-shaped rostrum. Nutlets smooth, brown, ovoid, 1.2 mm in diameter. Roots often malformed, with a gnarled appearance which may be caused by insects nesting within. Strong cinnamon-like odor to plant.

Acknowledgments: The assistance of Wayne R. Faircloth and John R. Bozeman with locality directions, H. A. Miller for the Latin diagnosis and L. Susan Sizemore for the illustration is gratefully acknowledged.

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- Huck, R. B. 1981. *Dicerandra cornutissima*, a new woody labiate from Florida. *Phytologia* 47: 313-316.

Figure 1. *Dicerandra radfordiana* Huck. A. Habit (scale 1 dm); B. flower (scale 1 cm); C. gynoecium and nectary (scale 1 cm); D. diagram of corolla dissected along upper keel, view of inferior tripartite lobe (scale 1 cm); E. anther, dorsal view (scale 1 mm); F. nutlet (scale 1 mm); G. root (scale 1 cm). Drawn from Huck 2181.



Dicerandra radfordiana Huck

Notes on American Gesneriaceae VIII

A. J. M. Leeuwenberg
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Wageningen, Netherlands

Drymonia psilocalyx Leeuwenberg, nom. nov.

Basionym: Drymonia psila Leeuwenberg, Misc.
Papers Landbouwh. Wageningen 19: 239. 1980, not
Drymonia psila D. Gibson, Phytologia 23: 335. 1972.

The present author is much obliged to Dr. L. E. Skog of the Smithsonian Institution who kindly informed him about having missed the earlier homonym for a species he described.

NOTES ON NEW AND NOTEWORTHY PLANTS. CXLVII

Harold N. Moldenke

AEGIPHILA HAUGHTII var. *SERRATIFOLIA* Mold., var. nov.

Haec varietas a forma typica speciei marginibus laminarum foliorum adpresse irregulariterque serratis recedit.

This variety differs from the typical form of the species in having the margins of the leaf-blades irregularly appressed-serrate.

The type of the variety was collected by John Terborgh and Robin B. Foster (no. 6525) at Cocha Cashu Station, at an altitude of 350 m., Río Manu, Parque Nacional del Manu, Madre de Díos, Peru, in July, 1978, and is deposited in the United States National Herbarium in Washington. The collectors describe the plant as a shrub, 3 m. tall, the "receptacles" [=fruiting-calyxes?] dark-red, the unripe fruits green.

AMASONIA LASIOCAULOS var. *MACROPHYLLA* Mold., var. nov.

Haec varietas a forma typica speciei laminis foliorum valde majoribus usque ad 40 cm. longis 11 cm. latis recedit.

This variety differs from the typical form of the species in its upper leaves, immediately below the inflorescence, being uniformly very much larger, to at least 40 cm. long and 11 cm. wide during anthesis.

The variety is based on a collection made by G. T. Prance, P. J. M. Maas, D. B. Woolcott, O. P. Monteiro, and J. F. Ramos (no. 15818) in a forest on terra firme at Tapuruquara in the basin of the Rio Negro, Amazonas, Brazil, on October 23, 1971, and deposited in the Britton Herbarium at the New York Botanical Garden. The collectors describe the plant as a shrub, 1 m. tall, with white "flowers" [=corollas?] and red fruit.

NOTES ON THE GENUS *TEUCRIDIMUM* (VERBENACEAE)

Harold N. Moldenke

Even though it is now impractical to try to prepare the thorough and detailed monograph of this genus as originally planned and announced, it may be worthwhile to place on record the bibliographic and herbarium notes on the genus assembled by my wife, Alma L. Moldenke, and myself over the past 52 years. The herbarium acronyms herein employed are the same as have been used by me in the long series of papers in this journal (and some other journals) on the previous 69 genera so treated and are most recently fully explained in *Phytologia Memoirs* 2: 463--469 (1980).

TEUCRIDIMUM Hook. f., *Fl. N. Zeal.* 1: 203, pl. 49. 1853.

Bibliography: Hook. f., *Fl. N. Zeal.* 1: 203, pl. 49. 1853; C. Müll. in Walp., *Ann. Bot. Syst.* 5: 704--705. 1860; Bocq., *Adanson*, ser. 1, 3: 86, 107, 119, 128, 149, 183, & 205--206. 1862; Hook. f., *Handb. N. Zeal. Fl.* 224, 739, & 795. 1864; F. Muell., *Fragm.* 6: 153. 1868; Benth., *Fl. Austral.* 5: 56. 1870; Pfeiffer, *Nom. Bot.* 2 (2): 1381. 1874; Benth. in Benth. & Hook. f., *Gen. Pl.* 2 (2): 1136 & 1157. 1876; Baill., *Hist. Pl.* 11: 87 & 114 (1891) and 11: 493. 1892; Briq. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 142, 173, 176, & 177, fig. 66 B--D. 1895; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 1, 2: 1055. 1895; Briq. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 1, 4 (3a): 383. 1897; Dalla Torre & Harms, *Gen. Siphonog.*, imp. 1, 433. 1904; Post & Kuntze, *Lexicon* 555 & 688. 1904; Cheeseman, *Man. N. Zeal. Fl.*, ed. 1, 566. 1906; Laing & Blackwell, *Pl. N. Zeal.*, ed. 1, 350--351 & 455. 1906; Cheeseman, *Man. N. Zeal. Fl.*, ed. 2, 764 & 1159. 1925; Laing & Blackwell, *Pl. N. Zeal.*, ed. 2, 354, 356, & 467. 1927; Stapf, *Ind. Lond.* 6: 277. 1931; Fedde & Schust., *Justs Bot. Jahresber.* 53 (1): 1076. 1932; Junell, *Symb. Bot. Upsal.* 1 (4): 128--130 & 204, fig. 206 & 207. 1934; Laing & Blackwell, *Pl. N. Zeal.*, ed. 4, 371, 373, & 498. 1940; Cranwell, *Rec. Auckl. Inst. Mus.* 2: 298. 1942; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 70 & 100. 1942; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 2, 2: 1055. 1946; Mols., *Alph. List Inv. Names Suppl.* 1: 21. 1947; H. N. & A. L. Mold., *Pl. Life* 2: 24 & 34. 1948; A. R. Cooper, *Rec. Auckl. Inst. Mus.* 3: 401. 1949; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 155 & 197. 1949; Erdtman, *Pollen Morph. Pl. Tax.*, ed. 1, 449. 1952; Angely, *Cat. Estat. Gen. Bot. Fan.* 17: 6. 1956; Mold., *Résumé* 211, 354, 413, & 470. 1959; Jacks. in Hook. f. & Jacks., *Ind. Kew.*, imp. 3, 2: 1055. 1960; Allan, *Fl. N. Zeal.* 1: 960. 1961; Hartl, *Beitr. Biol. Pfl.* 37: 293. 1962; Beuzenberg & Hair, *N. Zeal. Journ. Bot.* 1: 57 & 63, fig. 25. 1963; Dalla Torre & Harms, *Gen. Siphonog.*, imp. 2, 433. 1963; Cave, *Ind. Pl. Chromos.* 2: 330. 1964; Laing & Blackwell, *Pl. N. Zeal.*, ed. 7, 371, 373, & 498. 1964; F. A. Barkley, *List Ord. Fam. Anthoph.* 76 & 215. 1965; Dalla Torre & Harms, *Gen. Siphonog.*, imp. 2, 433. 1965; Airy Shaw

in J. C. Willis, Dict. Flow. Pl., ed. 7, 1113. 1966; Erdtman, Pollen Morph. Pl. Tax., ed. 2, 449. 1966; Stafleu, Tax. Lit. 208. 1967; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 1, 716. 1969; Rouleau, Guide Ind. Kew. 186 & 353. 1970; Balgooy, Blumea Suppl. 6: [Pl. Geogr. Pacif.] 200. 1971; Erdtman, Pollen Morph. Pl. Tax., ed. 3, 449. 1971; Mold., Fifth Summ. 1: 350 (1971) and 2: 641, 763, & 911. 1971; Mukhopadhyay, Pollen Morph. Verb. [thesis]. 1971; Went, Taxon 20: 199. 1971; Mold., Phytologia 23: 511. 1972; Mukherjee, Sci. Cult. 38: 143--144. 1972; Mukherjee, Pollen Morph. Aff. Teuc. [1]--3. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1143. 1973; Thanikaimoni, Trav. Inst. Franç. Pond. Sec. Scient. Tech. 12 (2): 123 & 149. 1973; Anon., Biol. Abstr. 58 (10): B.A.S.I.C. E.299. 1974; Gibbs, Flow. Pl. 3: 1752--1754. 1974; Bolkh., Grif, Matvej., & Zakhar., Chromos. Numb. Flow. Pl., imp. 2, 716. 1974; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Munir, Journ. Adelaide Bot. Gard. 1: 16 & 25. 1976; Thanikaimoni, Trav. Inst. Franç. Pond. Sect. Scient. Tech. 13: 233 & 328. 1976; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 44 & 47. 1978; Mold., Phytologia 46: 191 & 511. 1980; Mold., Phytol. Mem. 2: 340, 361, 445, & 578. 1980.

Tall herbs or much-branched, softly wooded and virgate subglabrous shrubs; branches slender, tetragonal, divaricate; branchlets sometimes in superposed pairs in the leaf-axils, tetragonal; leaves small, simple, decussate-opposite, petiolate, exstipulate, deciduous; leaf-blades spatulate or ovate-rounded, marginally entire or irregularly lobed; flowers small, axillary, solitary or in few-flowered cymes, short-pedicellate; two bracteoles borne beneath each flower, linear-setaceous; calyx gamosepalous, broadly campanulate, inferior, 5-veined, 5-lobed to about the middle, the lobes subequal, subulate, apically acute; corolla gamopetalous, zygomorphic, campanulate, the tube short, apically broadly ampliate, pilose, equaling the calyx, the limb conspicuously oblique, spreading, bilabiate, unequally 5-parted, the lobes oblong, apically obtuse, the posterior ones shorter and exterior, the anterior (lower) one longest; stamens 4, didynamous, attached at or somewhat above the base of the corolla-tube, long-exserted between the posterior corolla-lobes, incurved, fertile; anthers peltate, the 2 thecae confluent, 1-celled, finally outwardly extended, laterally dehiscent, dorsifixed at the middle; pistil single, compound; style basally sunken between the ovarylobes, exserted, arcuate, apically bifid, the branches subulate and apically short-stigmatiferous; ovary compound, superiot, bicarpellary, shortly 4-lobed apically and there densely pilose or villous, 2- or imperfectly 4-celled, the cells each 1-ovulate; ovules attached laterally at the middle, pendulous; fruit small, drupaceous, sunken in the persistent fruiting-calyx, 4-lobed almost to the middle, virtually dry, the exocarp only thinly fleshy, hispid, the endocarp heavy, ultimately splitting into 4 pyrenes or nutlets; seeds attached laterally, one in each pyrene, exalbuminous, the testa thin; cotyledons large, ovate, radicle inferior, short.

Type species: *Teucrium parvifolium* Hook. f.

As far as is known now, this is a monotypic rather variable genus endemic to New Zealand, named in allusion to its resemblance to the lamiaceous genus *Teucrium*, the wood-sages or germanders. It is peculiar because of its obvious lamiaceous gynoeceum with a sunken style-base. Cheeseman (1925) avers that, in spite of this character, it is allied to *Vitex* Tourn. Benth (1876) says of it: "Genus inter *Viticeas* inflorescentia et habitu anomalum et tribum arcte cum *Ajugoides* *Labiatarum* connectit, sed ovarium et fructus potius priorum."

Hooker (1864) says that it is "A genus of two species, one found in subtropical Australia (*T. sphaerocarpum*, Muell.), the other the following [*T. parvifolium*]. The lobed ovary is anomalous in the Order [*Verbenaceae*], and shows a tendency towards *Labiatae*, but the reversed position of the flower at once distinguishes this."

Angely (1956) also asserts that the genus contains two species, but, as now interpreted, it contains only a single species and a rather questionable subspecific form. The "second" species mentioned by Hooker (above) apparently is a mis-identification of an Australian species of *Spartothamnella* Briq.

It is worth noting here that Hooker's original description of *Teucrium* is often cited as having been published in "1854" -- as, for instance, by Pfeiffer (1874), Post & Kuntze (1904), Jackson (1895), Dalla Torre & Harms (1906), and Angely (1956) -- but the actual date of publication of pages 1--160 of volume 1 was 1852 and of pages 161--312 was 1853, as pointed out by Stafleu (1967). Stapf (1931) uses the correct date.

Junell (1934) gives a lengthy and important account of the gynoeceum morphology and relationships of the genus: "Die mittleren Partien der Fruchtblätter besitzen an der Innenseite ziemlich kräftiger Anschwellungen und verwachsen sowohl oberhalb dieses Niveaus als auch unten im Fruchtknoten mit den Plazenten. Letztere verwachsen erst verhältnismässig tief unten im Fruchtknoten ineinander. Die Stellung der Samenanlagen im Verhältnis zur Plazenta ergibt sich aus Fig. 206. Die Wandung der Höhle zwischen den Plazenten ist reichlich mit Drüsenhaaren besetzt."

"In Engler & Prantl....wird angegeben, dass die Frucht ein mehr oder weniger fleischiges Exokarp besitzt. Hooker....macht bei Beschreibung der Pflanze folgende Angaben: 'Fruit a small fourlobed hispid nut, sunk in the bottom of the withered persistent calyx, of four achenia, each hard, one-celled, with one pendulous exaluminous seed.' Ich hatte Gelegenheit, einige wenige Früchte zu studieren. Die Wandung der Teilfrucht ist hart und kann sicher nur ganz wenig fleischig gewesen sein."

"In Engler & Prantl wird, wie erwähnt, diese Gattung in *Clerodendreae* untergebracht. Hooker....bezeichnet die Pflanze als 'a very curious plant, resembling a *Teucrium*; but truly *Verbenaceae*, and though so different in habit, allied to *Vitex*.' Benth.... ist der Ansicht, dass die vierteilige Fruchtknoten und die Frucht für eine Verwandtschaft sprechen mit '*Oxera* and a few other genera, which connect *Verbenaceae* with the tribe *Ajugoidae* of *Labiatae*.'"

Auch Cheeseman.....verweist auf die Verwandschaft mit *Vitex*: 'Although allied to *Vitex*, it has the anomalous character of a 4-lobed ovary, thus showing an approach to the *Labiatae*.' Die Gattung kann meines Erachtens gut in *Ajugeae* eingereiht oder wenigstens als Übergangstypus zu dieser Subtribus betrachtet werden. Als solcher Übergangstypus wäre die Gattung vielleicht am ehesten an der Spitze dieser Gruppe einzureihen. Dass *Teucrium* mit *Vitex* oder *Viticeae* nahe verwandt sein soll, scheint mir wenig glaubhaft. Demgegenüber liegen zahlreiche Gründe für eine Anknüpfung der Gattung an *Clerodendreae* vor. Aus der Stellung der Samenanlagen ergibt sich jedoch, dass diese Anknüpfung nicht bei *Oxera* oder ihr benachbarten Gattungen zu erfolgen hat.....Die Subtribus [*Ajugeae*] weicht dadurch von den übrigen in *Viticoideae* ab, dass die Frucht zerfällt und trocken ist. Bei *Teucrium* und *Spartothamnus* scheint jedoch die Frucht etwas saftig zu sein. Die Entwicklung zur trockenen Frucht wurde in diesem Falle nicht von einer Reduktion der Samenanzahl begleitet wie bei *Petraelovites* und *Teijsmanniodendreae*.

"*Ajugeae* ist meines Erachtens als eine direkte Fortsetzung der Gruppe von Gattungen in *Clerodendreae* zu betrachten, bei denen die Samenanlagen nicht ungewöhnlich hoch inseriert sind. Die auscheinend ursprünglichsten Gattungen in *Ajugeae* stimmen mit *Clerodendreae* darin überein, dass die Sträucher sind. Die Mehrzahl der Gattungen sind jedoch Kräuter oder Halbsträucher."

Excluded species: *Teucrium sphaerocarpum* Muell. ex Hook. f., Handb., N. Zeal. Fl. 224 & 739. 1864 = *Spartothamnella* sp., *Chloanthaceae*.

TEUCRIDUM PARVIFOLIUM Hook. f., Fl. N. Zeal. 1: 208, pl. 49. 1853.

Synonymy: *Spartothamnus hookeri* F. Muell., Fragm. 6: 153. 1868. *Teucrium parviflorum* Hook. f. ex Mold., Alph. List Inv. Names Suppl. 1: 21, in syn. 1947; Erdtman, Pollen Morph. Pl. Tax., ed. 1, 449. 1952. *Teucrium paucifolium* A. Cunn. ex Mold., Phytol. Mem. 2: 445, in syn. 1980.

Bibliography: see bibliography of the genus as a whole (above).

Illustrations: Hook. f., Fl. N. Zeal. 1: pl. 49. 1853; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 176, fig. 66 B--D. 1895; Junell, Symb. Bot. Upsal. 1 (4): 128, fig. 206 & 207. 1934; Beuzenberg & Hair, N. Zeal. Journ. Bot. 1: 63, fig. 25. 1963; Mukherjee, Sci. Cult. 38: 144, fig. 1. 1972; Mukherjee, Pollen Morph Aff. Teuc. 2. 1972.

An erect, much- and closely-branched, slender, twiggy, soft-wooded shrub, 0.7--1.8 m. tall, forming close thickets, dichotomously branched, the branches and leaves more or less pubescent; branches slender, twiggy; branchlets tetragonal, pubescent when young; leaves rather distant; petioles 4--12.5 mm. long, equaling the leaf-blade; leaf-blades membranous, orbicular or orbicular-ovate to ovate-spatulate or spatulate. or even broadly ovate or elliptic, 4--15 mm. long, apically obtuse, sometimes irregularly lobed; flowers axillary, solitary or in very small few-flowered cymes; peduncles short, 2-bracteolate; flowers about 8 mm. long;

calyx campanulate, persistent, the 5 teeth subulate, apically sharply acute; corolla campanulate, white or sometimes flushed with pale-blue or blue, hairy, 8--12.5 mm. long; fruiting-calyx 4 mm. in diameter; nutlets (cocci) hispid; chromosome number: $2n = 64$.

This, the type species of the genus, is based on an unnumbered Colenso collection from the Wairarapa Valley, on North Island, New Zealand, deposited in the Kew herbarium. The species is endemic to New Zealand, especially the marginal areas of both islands from 35° to $46^{\circ}30'$ lat., but is local in distribution and not common anywhere. It flowers from October to January and fruits from December to March.

Beuzenberg & Hair (1963), Cave (1964), and Bolkhovskikh & al. (1969) all report the haploid chromosome number as 32.

The only common or vernacular name reported for the plant is "small-leaved teucrium".

Junell (1934) has described the gynoecium morphology (see above) and Erdtman (1952) the pollen -- both on the basis of *Du Rietz & DuRietz 1166-1* in the Stockholm herbarium. Erdtman's description of the pollen is: "3-colpate (operculicolate), prolate (48×34 μ). Sexine thicker than nexine, particularly at the poles. L0 (probably S-pattern). Grains of almost exactly the same type as those of *Teucrium*." Mukherjee (1972) has amplified this description as follows: "pollen grains 3-colpate, colpa provided with operculum, about $35.5 \mu \times 6.0 \mu$. Mean intercolpial distance $\pm 19.5 \mu$. Amb convex. Mean apocolpium diameter about 8.0μ . Prolate, P/E about $42.0 \mu \times 36.0 \mu$. Exine about 4.0μ and about 2.0μ thick at poles and at equator respectively. Sexine about 3.5μ and about 1.5μ at the said regions respectively. Pertectate. tectum thick and solid, beset with excrescences. Nexine 0.5μ thick." He comments that the "Pollen morphology of the two genera, *Teucrium* (*Verbenaceae*) and *Teucrium* (*Labiatae*), display almost every possible similar characters [sic]. The pollen grains of both the genera are 3-colpate with operculum in colpa, pertectate sexine with excrescences on tectum, thicker polar exine, similarity in shape, etc. Only minor differences are there. It may be mentioned that such pollen characters are absent in other members of the said families.

"Gross morphologically the close affinity of the two families which were put forward by various authors has also been supplemented by palynology. Both *Teucrium* and *Teucrium*, although belong[ing] to two different families, display almost the same morphological characters" and since "Similarity of structure.... [is] taken as a sure indication of genetic relationship"..... such relationship "is reflected in both gross morphology as well as....palynology" and the "close affinity of *Verbenaceae* and *Labiatae*" is further suggested by the pollen morphology of these two genera.

Gibbs (1974) reports saponins "probably present" and tannins "probably absent" in *T. parvifolium*; cyanogenesis and leucoanthocyanin and syringin are absent; the Juglone test proved negative (bark) and the HCl/methanone test also gave negative results, but the Ehrlich test (leaves) gave positive (pale-green) results.

Recent collectors describe the plant as a shrub, 2--3 feet tall, and have found it growing among rocks on exposed hillsides and in lowland mixed rainforests, flowering in December and fruiting in March.

It should be pointed out here again that the original publication of this species is mis-dated "1854" -- it was actually published in 1853. Hooker (1864) cites unnumbered collections of Colenso from North Island and of Bidwill, Raoul, and Traverse from "Middle Island", the last-mentioned collected at Nelson and at Canterbury Plains. Cheeseman (1925) cites unnumbered collections of Adams, Armstrong, Aston, Bidwill, Buchanan, Cockayne, Colenso, Kirk, Petrie, Raoul, Traverse, "and others" from both North and South Islands.

Citations: NEW ZEALAND: North: *DuRietz & DuRietz 1166.1* (S), 3341 (S); *Poole 56562* (Er, Z). South: *A. W. Anderson 89* (Ca--586686, N, W--1675961); *Berggren s.n.* [Jan. 1874] (S); *Cheeseman s.n.* [Foxhill, Nelson] (Bi), *s.n.* [Jan. 1882] (W--206576), *s.n.* [1882] (Pa); *Cranwell s.n.* [Kitchener Park, June 1932] (Ca--517845, Ca--517846), *s.n.* [Kitchener Park, 26/6/32] (Gg--204314); *Haast s.n.* [Canterbury, 1866] (Br, Br); *Neal 452* (Bi). Island undetermined: *Allen s.n.* [4/1/33] (Go, N--photo, Z--photo); *Meebold 4378* (Ba, Mu, Z). CULTIVATED: New Zealand: *E. H. Walker 4755* (W--1994076).

TEUCRIDIMUM PARVIFOLIUM f. *LUXURIANS* (Cheeseman) Mold., stat. nov.

Synonymy: *Teucridium parvifolium* var. *luxurians* Cheeseman, Man. N. Zeal. Fl., ed. 2, 764. 1925.

Bibliography: Cheeseman, Man. N. Zeal. Fl., ed. 2, 764. 1925; Fedde & Schust, Justs Bot. Jahresber. 53 (1): 1076. 1932; R. Cooper, Rec. Auckl. Inst. Mus. 3: 401. 1949; Mold., Résumé 211 & 470. 1959; Allan, Fl. N. Zeal. 1: 960. 1961; Mold., Fifth Summ. 1: 350 (1971) and 2: 911. 1971; Mold., Phytol. Mem. 2: 340 & 578. 1980.

This form differs from the typical form of the species only in having generally larger leaves, the blades up to 20 mm. long and often lobed and the flowers usually (but not invariably) in 2- or 3-flowered cymes.

The form is based on an unnumbered H. H. Allan collection from river-flats by the Mangles River (a tributary of the Buller River), in the Buller Valley, South Island, New Zealand, deposited in the Auckland Museum herbarium.

Allan (1961) avers that "Similar forms occur elsewhere within the range of the species. It is probable that the differences are due to different habitat conditions", making it only an edaphic form. As yet I have seen no authentic material of it.

NOTES ON THE GENUS *URBANIA* (VERBENACEAE)

Harold N. Moldenke

Since time is no longer available to me for the preparation of the detailed monograph of this genus originally planned and announced, it seems best now to place on record the bibliographic and herbarium notes on this genus assembled by my wife, Alma L. Moldenke, and myself over the past 52 years, the 71st genus to be treated by me since the work began in 1929. The herbarium acronyms herein employed are the same as have been used consistently in this entire series of papers in this journal (and in some other journals) and most recently fully explained in *Phytologia Memoirs* 2: 463--469 (1980).

URBANIA R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: 60. 1891, nom. conserv. [not *Urbania* Vatke, 1875, nom. rejic.].

Bibliography: Vatke, Oesterr. Bot. Zeitschr. 25: 10. 1875; R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Cat. Praev. Pl. Itin. Tarap.] 60, pl. 2, fig. 7. 1891; R. A. Phil., Verz. Hocheb. Prov. Antofag. 60, pl. 2, fig. 7. 1891; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, Nachtr. zu 4 (3a): 290. 1897; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 430. 1904; Post & Kuntze, Lexicon 581 & 688. 1904; Thiseit.-Dyer, Ind. Kew. Suppl. 2: 1149. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 446. 1906; Reiche, Estud. Crit. Fl. Chile 296--297. 1907; Reiche & Phil., Fl. Chile 5: 272 & 296--297. 1910; M. Kunz, Anatom. Untersuch. Verb. 32 & 33. 1911; Stapf, Ind. Lond. 6: 393. 1931; Junell, Symb. Bot. Upsal. 1 (4): 17. 1934; Greene, Kew Bull. Misc. Inf. 1935: 526. 1935; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 446. 1941; Mold., Suppl. List Inv. Names 7. 1941; Mold., Alph. List Inv. Names 44. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 42 & 101. 1942; H. N. & A. L. Mold., Pl. Life 2: 30 & 87. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 101 & 197. 1949; Metcalfe & Chalk, Anat. Dicot. 1031, 1032, & 1041. 1950; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 49--50. 1951; Angely, Cat. Estat. Gen. Bot. Fan. 17: 6. 1956; Cabrera, Revist. Invest. Agric. 11: 336, 366, & 398. 1957; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 446. 1959; Mold., Résumé 121 & 470. 1959; Muñoz Pizarro, Espec. Pl. Descr. Phil. 110. 1960; Rickett & Stafleu, Taxon 9: 84. 1960; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 430. 1963; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 218. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 1166. 1966; Rouleau, Guide Ind. Kew. 195 & 353. 1970; Heusser, Poll. Spores Chile 61, pl. 57-664. 1971; Mold., Fifth Summ. 1: 192 (1971) and 2: 645, 752, & 911--912. 1971; Mold., Phytologia 23: 511. 1972; Stafleu, Internat. Code Bot. Nom. 354 & 392. 1972; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1196. 1973; Troncoso, Darwiniana 18: 296, 302, 304, 319--321, & 411, fig. 4. 1974; Thanikaimoni, Inst. Franç. Pond. Trav. Sect. Scient. Techn.

13: 242 & 328. 1976; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41 & 47. 1978; Mold., Phytol. 2: 183, 446, & 579. 1980; Unger, Bot. Soc. Am. Misc. Ser. Publ. 158: 120. 1980; Mold., Phytologia 47: 411 & 512. 1981.

Low caespitose shrubs or subshrubs forming woody mats a few cm. tall, with subterranean trunks and branches and the young shoots appressed to the surface of the soil; leaves decussate-opposite, simple, minute, somewhat fleshy, exstipulate, densely imbricate; flowers inconspicuous, sessile, hidden by the dense calyx-hairs, complete, perfect, borne in groups of 1--4 at the tips of the branchlets; calyx gamosepalous, inferior, prismatic-tubular, slender, very short, deeply 5-parted, the segments filiform to linear or narrow-oblong, externally copiously pilose on the upper half with long, white, dense tufts of antrorse hairs; corolla gamopetalous, diminutive, infundibular, glabrous, its tube subcylindric, apically gradually ampliate, the limb 5-lobed, the lobes short, subequal, apically rounded or emarginate; stamens 4, didynamous, fertile, inserted in the upper half of the corolla-tube, included; filaments very short; anthers subsessile, oblong, basifixed, eglandular; pistil single, compound; style single, filiform, terminal; stigma shortly bilobed, the posterior lobe apically acute, the anterior one capitate and papillose; ovary superior, 4-celled, bicarpellary, each carpel forming 2 cells, each cell 1-ovulate; ovules attached at the base of the cell; fruit schizocarpous, dry at maturity, easily separating into 4 mericarps (schizocarps) which are subcylindric and dorsally reticulate; seeds 4, oblong, without endosperm (exalbuminous).

Type species: *Urbania pappigera* R. A. Phil.

This is a small genus of 2 known species endemic to the Argentine-Chilean high-andean puna. It is named in honor of Ignatz Urban (1848--1931), well-known German taxonomist at Berlin, noted for his critical work on the plants of the West Indies. Philippi rightly comments that the "capitulum *Synantherarum* mentientibus", for the long erect white calyx-hairs certainly do resemble the pappus of composite flower-heads.

Troncoso (1974) comments that "Género muy afín a *Verbena*, secc. *Junellia*, se diferencia por su cáliz profundamente 5-partido con lóbulos lineales y largamente pilosos; en *Verbena* es cilíndrico-tubuloso, 5-dentado, con dientes en general breves, argudos o subulados".

The generic name, *Urbania*, proposed by Philippi (1891), unfortunately is conserved under the International Code of Botanical Nomenclature (1972) over the *Urbania* of Vatke (1875), now regarded as a synonym of *Lyperia* Benth. in the *Scrophulariaceae*. There is also a genus *Neo-urbania* Fawc. & Rendle, Journ. Bot. Brit. For. 47: 125 (1909) which is apparently a valid genus in the *Orchidaceae*. Incidentally, *Urbania* is credited to "R. Philippi" and listed under the *Boraginaceae* by Rickett & Stafleu (1960).

The Zöllner 5371, distributed as *Urbania* sp., actually is *Junellia aspera* (Gill. & Hook.) Mold., while Werdermann 263 & 957 are *Kurtzamia pulchella* (Clos.) Kuntze in the *Lamiaceae*. A specimen of the first-mentioned Werdermann collection in the Berlin her-

barium was photographed by Macbride and distributed by the Field Museum of Natural History in Chicago as its type photograph number 20317, identified as *Urbania odorata* Werd. (apparently only a cheironym).

Briquet (1897) comments that "Diese Gattung scheint mir nach der Beschreibung, wenn die Verwandtschaftsverhältnisse vom Autor richtig gedeutet worden, von *Verbena* durch Kelch und Griffel in der That vortrefflich unterschieden zu sein."

Junell (1934), on the basis of *Werdermann 1019* in the Berlin herbarium, says: "Derselbe Fruchtknoten wie bei *Verbena*. Die Verwachsung zwischen den mittleren Partien der Fruchtblätter und den einwärts gekrümmten Teilen derselben erfolgt tief unter im Fruchtknoten. In diesen Niveau ist die Mittelpartie des Fruchtblattes wie bei einigen *Verbena*-Arten etwas verdickt und schwach gespalten. Die Höhle in der Mitte des Fruchtknotens ist sehr bedeutend, da die eingerollten Partien der Fruchtblätter zum grössten Teil miteinander verwachsen sind. Die Vierteilung des Fruchtknotens ist daher hier nicht so deutlich wie bei *Verbena*."

Excluded taxa:

Urbania Vatke, Oester. Bot. Zeitschr. 25:10. 1875 = *Lyperia* Benth., *Scrophulariaceae*.

Urbania lyperiaefolia Vatke, Oester. Bot. Zeitschr. 25: 10. 1875 = *Lyperia* sp., *Scrophulariaceae*.

Urbania lyperiaefolia Vatke, Linnaea 43: 306. 1882 = *Lindenbergia sinaica* Benth., *Scrophulariaceae*.

Urbania odorata Werd. ex Mold., Suppl. List Inv. Names 7, in syn. 1941; Alph. List Inv. Names 44, in syn. 1942 = *Kurtzamra pulchella* (Clos.) Kuntze, *Lamiaceae*.

An artificial key to the accepted taxa:

1. Leaves ovate, apically obtuse; flowers in groups of 3 or 4....
.....*U. pappigera*.
- 1a. Leaves ovate-linear, apically acute; flowers solitary.....
.....*U. eganioides*.

URBANIA EGANIROIDES R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: 60, pl. 2, fig. 7 (a & b). 1891.

Synonymy: *Urbania eganioides* R. A. Phil. ex Reiche, Estud. Crit. Fl. Chile 296 & 297. 1907.

Bibliography: R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Cat. Praev. Pl. Itin. Tarap.] 60, pl. 2, fig. 7 (a & b). 1891; R. A. Phil., Verz. Hocheb. Prov. Antofag. 60, pl. 2, fig. 7 (a & b). 1891; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 446. 1906; Reiche, Estud. Crit. Fl. Chile 296 & 297. 1907; Reiche & Phil., Fl. Chil. 5: 296 & 297. 1910; Stapf, Ind. Lond. 6: 393. 1931; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 446. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 42 & 101 (1942) and ed. 2, 101 & 197. 1949; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 49--50. 1951; Durand & Jacks., Ind. Kew. Suppl., imp. 3, 446. 1959; Mold., Résumé 121 & 470. 1959; Muñoz Pizarro, Espec. Pl. Descr. Phil. 110. 1960; Mold., Fifth Summ. 1: 192 (1971)

and 2: 911. 1971; Troncoso, Darwiniana 18: 296, 300, 302, 319--321, & 411, fig. 4. 1974; Mold., Phytol. Mem. 2: 183, 446, & 579. 1980.

Illustrations: R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Cat. Praev. Pl. Itin. Tarap.], pl. 2, fig. 7 (a & b). 1891; R. A. Phil., Verz. Hocheb. Prov. Antofag. pl. 2, fig. 7 (a & b). 1891.

A dwarf, ramose subshrub, about 5 cm. tall, forming a close mat; stems woody, basally 2 mm. thick; leaves closely antrorsely imbricate, linear or ovate-linear, 3--4 mm. long, basally almost 2 mm. wide, forming a pseudo-involucre beneath the flower and there slightly longer and brighter-green, the lower cauline ones smaller and pale-ferruginous, all apically acute and dorsally carinate; flowers solitary, sessile at the apex of the branchlets; calyx basally membranous, with 5 green veins; corolla short, about 2 mm. long, apparently rose-color, the tube apically pubescent below the limb; seeds black, 2 mm. long, smooth.

This species is based on R. A. Philippi 269 from the province of Tarapaca, Chile. Philippi states that it was growing among the material of *U. pappigera* distributed as his no. 268 "en las mismas localidades". Troncoso (1974) is doubtful about its validity as a separate species -- perhaps varietal or even only form status for it would be more appropriate. More field work and careful collecting are required to settle this question. Reiche (1907) also comments concerning it: "Difiere de la especie anterior [*U. pappigera*] por la ramificacion mas floja, las hojas aovado-lineares, de 3--4 mm.; las flores solitarias (siempre?): las nuecesitas (maduras?) con el dorso no reticulado. La descripcion se funda sobre una sola ramita corta -- acaso de la periferia de un césped de la especie anterior?"

I have seen no material of this taxon, apparently known only from the original collection deposited in the Berlin herbarium and now probably destroyed.

URBANIA PAPPIGERA R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Car. Praev. Pl. Itin. Tarap.] 60, pl. 2, fig. 7 (c--k). 1891.

Synonymy: *Urbania papygera* Phil. ex M. Kunz, Anatom. Untersuch. Verb. 32 & 33. 1911.

Bibliography: R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Cat. Praev. Pl. Itin. Tarap.] 60, pl. 2, fig. 7 (c--k). 1891; R. A. Phil., Verz. Hocheb. Prov. Antofag. 60, pl. 2, fig. 7 (c--k). 1891; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 446. 1906; Reiche, Estud. Crit. Fl. Chile 296 & 297. 1907; Reiche & Phil., Fl. Chil. 5: 296 & 297. 1910; Stapf, Ind. Lond. 6: 393. 1931; Junell, Symp. Bot. Upsal. 1 (4): 17. 1934; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 446. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 42 & 101 (1942) and ed. 2, 101 & 197. 1949; Acevedo de Vargas, Bol. Mus. Nac. Hist. Nat. Chile 25: 50. 1951; Cabrera, Revist. Invest. Agric. 11: 366 & 398. 1957; Mold., Résumé 121 & 470. 1959; Muñoz Pizarro, Espec. Pl. Descr. Phil. 110. 1960; Rickett & Stafleu, Taxon 9: 84. 1960; Heusser, Pollen Spores Chile 61, pl. 57-664. 1971; Mold., Fifth Summ. 1: 192 (1971) and 2: 645 & 912. 1971;

Troncoso, Darwiniana 18: 320 & 321, fig. 4. 1974; Mold., Phytol. Mem. 2: 183 & 579. 1980.

Illustrations: R. A. Phil., Anal. Mus. Nac. Chile Bot. 1: [Cat. Praev. Pl. Itin. Tarap.] 60, pl. 2, fig. 7 (c--k). 1891; R. A. Phil., Verb. Hochsch. Prov. Antofag. 60, pl. 2, fig. 7 (c--k). 1891; Heusser, Pollen Spores Chile 61, pl. 57-664. 1971; Troncoso, Darwiniana 18: 320, fig. 4. 1974.

Dwarf subshrub, with a stout, vertical, woody taproot, densely and closely caespitose; stems to 1 cm. in diameter; branches to 10 cm. long, prostrate, much branched and interlaced, forming a flat mat about 4 cm. high; leaves very small, closely antrorsely imbricate, ovate, reddish-green, 2--3 mm. long, apically obtuse, hispidulous, marginally long white-villous, the upper ones forming a pseudo-involucre around the flowers; flowers in groups of 3 or 4 at the tips of the branches, sessile; calyx about 4 mm. long, its tube about 1 mm. long and the long-villous linear lobes 3 mm. long, the erect white hairs simulating the pappus of composite flowers; corolla small, 5 mm. long, pale- to deep-rose in color, the tube 4 mm. long, the throat open, the limb patulous, 2 mm. wide, its 5 lobes cuneate-oblong, apically rounded to slightly retuse; seeds 1.5 mm. long, dorsally reticulate-rugose, with a central finely papillose keel (as is seen also in various species of (*Verbena*)).

This, the type species of the genus, is based on a collection made by F. Philippi (no. 268) near Minique, Tarapacá, Chile, in January of 1889 and probably deposited in the herbarium of the Museo Nacional de Historia Natural at Santiago, Chile. Reiche (1907), however, states that the species grows "En el interior de las provincias de Tarapacá i Antofagasta, 4,000 m. (p. e. en el rejion de Llullaillaco)", flowering in January and February.

Heusser (1971) describes the pollen as: "Monad, isopolar, radiosymmetric; heterocolpate, colpi in three sets of three each, colpi in each group in proximity, the middle colpus crossed equatorially by a prominent transverse pore which is usually constricted, protruding, and extending to the lateral colpi, these latter apparently pseudocolpi; mostly oblate spheroidal, amb triangular; exine ca. 1 μ thick, tectate, psilate; 23--29 x 25--29 μ " based on an unnumbered Reiche collection from Llullaillaco, collected in February, 1901, and deposited in the Britton Herbarium at the New York Botanical Garden.

Recent collectors have encountered this plant at 4000--4500 m. altitude, in flower in February and March. Cabrera (1957) cites his nos. 8789 & 9057 from Salta, Argentina; Troncoso (1974) cites *Martcorena*, *Mathei*, & *Quesada* 388 from Tarapacá and *Ricardi* & *Martcorena* 4675/1060 from Antofagasta, Chile, and *Cabrera* 8789 from Salta, Argentina. The photograph (no. 17398) made by Macbride for the Field Museum in Chicago depicts a specimen then in the Berlin herbarium, but said to be from Atacama, Chile, so probably not the type collection.

Citations: CHILE: Antofagasta: *C. Reiche* 15 (N); *Werdermann* 1019 (E--937883, Gg--147445, Mu, N, S, W--1474179). Atacama: *R. A. Philippi* s.n. [Macbride photos 17398] (B--photo, Kr--photo, N--photo, W--photo, W--photo). Tarapaca: *F. Philippi* s.n. [Herb.

Mus. Nac. Hist. Nat. Chile 42497] (N--photo of type); Werdermann 1098 (Gg--147475, Mu, N, S, W--1541142).

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NOTES ON THE GENUS *UBOCHEA* (VERBENACEAE)

Harold N. Moldenke

This is the 72nd genus on which discussions have been published in this journal based on the bibliographic and herbarium work carried on by my wife, Alma L. Moldenke, and myself over the past 52 years.

UBOCHEA Baill., Hist. Pl. 11: 103. 1891.

Synonymy: *Upochea* Baill. ex Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41, sphalm. 1978.

Bibliography: Baill., Hist. Pl. 11: 81 & 103 (1891) and 11: 494. 1892; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 140, 142, 145, & 155. 1895; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 431. 1904; Post & Kuntze, Lexicon 579 & 688. 1904; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 1, 442. 1906; Thonner, Flow. Pl. Afr. 468. 1915; A. Chev., Rev. Bot. Appl. Agruc. Trop. 15: 913 & 1075--1076, fig. 35. 1935; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 2, 442. 1941; H. N. & A. L. Mold., Pl. Life 2: 30. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 111 & 197. 1949; Angely, Cat. Estat. Gen. Bot. Fam. 17: 6. 1956; Anon., U. S. Dept. Agr. Bot. Subj. Ind. 15: 14360. 1958; Durand & Jacks., Ind. Kew. Suppl. 1, imp. 3, 442. 1959; Mold., Résumé 136, 407, & 470. 1959; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 431. 1963; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 218. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 1160. 1966; Stearn, Botan. Latin 292 & 297. 1966; Rouleau, Guide Ind. Kew. 194 & 353. 1970; Mold., Fifth Summ. 1: 215 (1971) and 2: 755 & 911. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1191. 1973; Mukherjee & Chanda, Trans. Bose Res. Inst. 41: 41. 1978; Mold., Phytol. Mem. 2: 206, 446, & 578. 1980.

Glabrous dichotomously branched shrub; leaves simple, decussate-opposite, exstipulate, petiolate, the blades elliptic or oval, apically acuminate, marginally serrate; flowers in crowded terminal spikes, complete, perfect, similar to those of *Bouchea*, subtended by a single bract; calyx inferior, gamosepalous, tubular, 5-ribbed, the rim 5-toothed; corolla gamopetalous, infundibular, bilabiate, the lobes imbricate in bud; stamens 2, inserted in the corolla-tube, anterior in position; anthers basifixed, the two thecae divergent in a single plane; pistil single, bicarpellary; style single, terminal, slightly exserted; stigma capitate; ovary superior, compound, 2- or 3-celled, each cell 1-ovulate; fruit dry, schizocarpous, composed of two pyrenes (mericarps), one an-

terior and the other posterior in position.

Type species: *Ubochea dichotoma* Baill.

Baillon's original (1891) description of this genus (and species) is merely "Flores fere *Bouchea*, calyce tubuloso, 5-costato, 5-dentato. Corolla bilabiata imbricata. Stamina 2, antica, tubo affixa; antherarum loculis divaricatis superpositis rimosis. Germina 2-loculare; stylo gracili, apice exserto capitato. Ovula in loculis solitaria adscendentia. -- Frutex glaber dichotome ramosus; foliis oppositis elliptico-acuminatis serratis; floribus in spicis terminales congestis, 1-bracteatis. In Ins. Capit. viridis*U. dichotoma* H. Bn."

Although this genus has been maintained by all previous authors, Chevalier (1935) is of the opinion that it is invalid and is actually congeneric with *Stachytarpheta* Vahl. He argues as follows: "Les seules différences entre les genres *Stachytarpheta* Vahl et *Ubochea* Bn. seraient: le premier genre a 4 étamines dont 2 fertiles et 2 stériles très réduites; il a un ovaire uniloculaire avec 2 locelles latérales uniovulées, le second genre a 2 étamines seulement il a un ovaire biloculaire mais chaque loge se développe en 2 locelles uniovulées. Ces différences comme l'on voit sont minimes et ces différences ont pu du reste être mal observées par Baillon sur un vieux spécimen pauvre."

Briquet (1895) classifies *Ubochea* at the end of the Subfamily Verbenoideae Briq., Tribe Lantaneae Endl., between *Stachytarpheta* Vahl and *Priva* Adans.

UBOCHEA DICHOTOMA Baill., Hist. Pl. 11: 103. 1891.

Synonymy: *Stachytarpheta dichotoma* (Baill.) A. Chev., Rev. Bot. Appl. Agric. Trop. 15: 1076, nom. provis. 1935 [not *S. dichotoma* (Ruiz & Pav.) Vahl, 1804].

Bibliography: see bibliography of the genus as a whole (above).

Illustrations: A. Chev., Rev. Bot. Appl. Agric. Trop. 15: 1075, fig. 35. 1935.

This species, the type species of this apparently endemic Cape Verde Islands genus, is based on an unnumbered J. da Silva Feijo specimen deposited in the herbarium of the Museum National d'Histoire Naturelle in Paris. Chevalier (1935) says: "Genre et espèce endémiques mal connus, apparentés au g. *Bouchea* Cham. dont une espèce *B. marrubiiifolia* Schau. [now known as *Chascanum marrubiiifolium* Fenzl] habite la zone déserte depuis le Scind jus'qu'a la Mauritanie." He has modified Baillon's original description as follows: an entirely glabrous shrub; stems dichotomous, woody, tetragonal, subulate by the continuation of the decurrence from the petiole; leaves opposite, petiolate; petioles 0.8--1 cm. long; leaf-blades subcoriaceous, oval-lanceolate, 4--5 cm. long, 1.2--1.8 cm. wide, apically acuminate, basally cuneate and decurrent into the petiole, marginally crenate-dentate on the upper half, entire on the basal part; inflorescence terminal, spicate, few-flowered, the rachis short, glabrous, hard and rigid, 2.5--3.5 cm. long, basally 2 mm. in diameter, marked with oval-lanceolate excavations opposite each flower, these 2.5 cm. long, completely glabrous; calyx somewhat scarious, 1--1.2 cm. long.

Baillon comments, further, as follows: "Pour nous, il n'est pas douteux qu'il s'agit d'un *Stachytarpheta* Vahl. [sic] appartenant aux mêmes groupes que *S. mutabilis* Vahl. [sic] et *S. orubica* Vahl. [sic] (du Bresil); il ne diffère guère de celui-ci que par la glabréité. Nous le nommons provisoirement *Stachytarpheta dichotoma* (Bn.) A. Chev. et nous le regardons comme non autochtone dans l'Archipel capverdien. Ainsi disparaît le seul genre que nous considérons comme endémique."

Not having had the opportunity of studying any authentic material of this taxon, I am unable to judge its validity. More collecting in the type region is certainly required. It is perhaps worth pointing out, however, that neither *Bouchea* Cham., *Chascanum* E. Mey., nor *Svensonia* Mold. are as yet known from Senegal, the nearest country to the Cape Verde Islands, lying, as it does, just east of them -- and the only *Stachytarpheta* known from there is *S. angustifolia* (Mill.) Vahl, a species very different from the illustration given by Chevalier and the stated characters of *Ubochea dichotoma*.

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ADDITIONAL NOTES ON THE GENUS *VITEX*. XIX

Harold N. Moldenke

VITEX CAPITATA Vahl

Additional bibliography: Mold., *Phytologia* 48: 419. 1981.

Additional citations: VENEZUELA: Amazonas: *Steyermark & Redmond* 117087 (Ld). Apure: *Davidse & González* 15628 (Ld). Barinas: *Gentry, Morillo, & Morillo* 11148 (Ws). Guárico: *Aristeguita & Agostini* 4183 (N); *Ramírez* 65 (Ld). BRAZIL: Bahia: *Mori, Mattos, Silva, Santos, Kallunki, & Pennington* 9441 (N); *Mori, Silva, Kallunki, & Santos* 9925 (N).

VITEX CARBUNCULORUM Smith & Ramas

Additional bibliography: Mold., *Phytologia* 44: 399. 1979; Mold., *Phytol. Mem.* 2: 274, 287, & 589. 1980.

VITEX CARVALHI Gürke

Additional bibliography: Mold., *Phytologia* 44: 389 & 399. 1979; Mold., *Phytol. Mem.* 2: 231, 241, & 589. 1980.

VITEX CAULIFLORA Mold.

Additional bibliography: Mold., *Phytologia* 44: 399. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CAULIFLORA var. *LONGIFOLIA* Mold.

Additional bibliography: Mold., *Phytologia* 44: 399. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CAULIFLORA var. *VILLOSISSIMA* Mold.

Additional bibliography: Mold., *Phytologia* 44: 399--400. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CESTROIDES J. G. Baker

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CHARIENSIS A. Chev.

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 217 & 589. 1980.

VITEX CHARIENSIS var. *LATIFOLIA* A. Chev.

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 217 & 589. 1980.

VITEX CHRYSLERIANA Mold.

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 171 & 589. 1980.

VITEX CHRYSOCARPA Planch.

Additional bibliography: Mold., *Phytologia* 44: 400 & 479. 1979; Mold., *Phytol. Mem.* 2: 201, 205, 207, 209, 211--213, 221, 236, & 589. 1980.

VITEX CHRYSOMALLUM Steud.

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

Gentry refers to this plant as a treelet, 3 m. tall, with yellow "flowers" [corollas], exserted stamens, red anthers, and green fruit in April, and found it growing on sand in a scrubby forest at sealevel.

Additional citations: MADAGASCAR: A. Gentry 11358 (E--2737779).

VITEX CHRYSOMALLUM var. *LONGICALYX* Mold.

Additional bibliography: Mold., *Phytologia* 44: 400. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CHRYSOMALLUM var. *TOMENTELLA* Mold.

Additional bibliography: Mold., *Phytologia* 44: 400--401. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CILIATA Pierre

Additional bibliography: Mold., *Phytologia* 44: 401. 1979; Mold., *Phytol. Mem.* 2: 216, 217, & 589. 1980.

VITEX CILIO-FOLIOLATA A. Chev.

Additional bibliography: Mold., *Phytologia* 44: 401. 1979; Mold., *Phytol. Mem.* 2: 210 & 589. 1980.

VITEX CLEMENTIS Britton & P. Wils.

Additional bibliography: Mold., *Phytologia* 44: 401. 1979; Mold.,

Phytol. Mem. 2: 91 & 589. 1980.

VITEX COCHINCHINENSIS Dop

Additional bibliography: Mold., Phytologia 44: 401. 1979; Mold., Phytol. Mem. 2: 294 & 589. 1980.

VITEX COFASSUS Reinw.

Additional bibliography: Kosterm., Reinwardtia 1: 104 & 106. 1954; Fosberg, Sachet, & Oliver, Micronesica 15: 238. 1979; Fosberg, Otobed, Sachet, Oliver, Powell, & Canfield, Vasc. Pl. Oalau 38. 1980; Mold., Phytologia 45: 481 (1980), 46: 486, 489, & 491 (1980), and 47: 19. 1980; Mold., Phytol. Mem. 2: 310, 311, 319, 321, 323, 324, 328--330, 366, 394, 457, & 589. 1980; Mold., Phytologia 47: 355. 1981.

Recent collectors describe this plant as a medium-sized tree, 5--15 m. tall, with a 1-meter bole, the trunk diameter 30 cm. at breast height, the outer bark brown or light-brown and flakey, the inner bark cream or cream-yellow, the wood yellow-straw color, the leaves dark-green above, pale-green beneath, the flowers terminal, and the unripe fruit light-green. The corollas are said to have been "purple-white" on *Karenga* & al. LAE.73848 and "light-purple" on *Wiakabu* & *Hausari* LAE.70358. It has been collected in flower and fruit in January at 77 m. altitude.

Additional citations: NEW GUINEA: Northeast New Guinea: *Kerenga* & al. LAE.73848 (Mu); *Wiakabu* & *Hausari* LAE. 70358 (Mu,W-2894968).

VITEX COFASSUS f. *ANOMALA* Mold.

Additional bibliography: Mold., Phytologia 44: 405. 1979; Mold., Phytol. Mem. 2: 319, 323, 324, 366, & 589. 1980.

VITEX COFASSUS var. *PUBERULA* H. J. Lam

Additional bibliography: Mold., Phytologia 44: 405. 1979; Mold., Phytol. Mem. 2: 328, 329, & 589. 1980.

VITEX COLUMBIENSIS Pittier

Additional bibliography: Mold., Phytologia 45: 482. 1980; Mold., Phytol. Mem. 2: 112 & 589. 1980.

VITEX COMPRESSA Turcz.

Additional bibliography: Mold., Phytologia 45: 482 (1980) and 47: 17. 1980; Mold., Phytol. Mem. 2: 103, 104, 112, 121, 123--126, 171, 366, & 589. 1980.

Recent collectors have found this plant growing in disturbed primary forests, at 250 m. altitude, flowering and fruiting in June, and describe it as a tree, 15--16 m. tall, the trunk 80 cm. in diameter at breast height, the leaves light yellowish-green on both surfaces, the calyx rose-maroon. Delascio & Liesner found it on "sabanias de lomas con matorrales deciduos". The corollas on *Liesner* & al. 8421 are said to have been "blue with a yellow patch at base of lower lip" and on *Blanco* 863 "white, the large lobe purple within".

The *Steyermark* & *Manara* 107898, distributed as typical *V. com-*

pressa, actually represents *f. angustifolia* Mold.

Additional citations: VENEZUELA: Bolívar: *Bernardi* 7400 (W--2946041); *C. Blanco* 839 (E--2774726), 863 (E--2774727); *Delascio & Liesner* 7404 (E--2774718). Falcón-Lard: *Liesner, González, & Wingfield* 8421 (Ld).

VITEX COMPRESSA f. ANGUSTIFOLIA Mold., *Phytologia* 47: 17. 1980.

Bibliography: Mold., *Phytologia* 47: 17. 1980; Mold., *Phytol. Mem.* 2: 121 & 589. 1980.

Steyermark & Manara describe this plant as a tree, 5 m. tall, the calyx "dull-purple with gray-green, the corolla pale-lavender" and the filaments "white with lilac", and have encountered it at sealevel to 20 m. altitude, flowering in September. Material has hitherto been confused with and distributed as typical *V. compressa* Turcz.

Citations: VENEZUELA: Falcón: *Liesner, González, & Wingfield* 8279 (Z--type). Arapo Island: *Steyermark & Manara* 107898 (N).

VITEX CONGENSIS A. Chev.

Additional bibliography: Mold., *Phytologia* 44: 407. 1979; Mold., *Phytol. Mem.* 2: 221 & 589. 1980.

VITEX CONGESTA Oliv.

Additional bibliography: Mold., *Phytologia* 44: 407. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

VITEX CONGOLENSIS DeWild. & Th.-Dur.

Additional bibliography: Mold., *Phytologia* 44: 407--408. 1979; Mold., *Phytol. Mem.* 2: 209, 214, 221, 234, & 589. 1980.

VITEX CONGOLENSIS var. *GILLETTII* (Glurke) Pieper

Additional bibliography: Mold., *Phytologia* 44: 408. 1979; Mold., *Phytol. Mem.* 2: 221 & 589. 1980.

VITEX COOPERI Standl.

Additional bibliography: Mold., *Phytologia* 45: 482 (1980) and 46: 10. 1980; Mold., *Phytol. Mem.* 2: 73, 76, 80, 82, 84, & 589. 1980; Seymour, *Phytol. Mem.* 1: 246. 1980.

VITEX COURSI Mold.

Additional bibliography: Mold., *Phytologia* 44: 409. 1979; Mold., *Phytol. Mem.* 2: 251 & 589. 1980.

Gentry has found this plant growing in a mostly native forest with *Eucalyptus*, at 1000 m. altitude.

Additional citations: MADAGASCAR: A. Gentry 11252 (E--2737773).

VITEX CRENATA A. Chev.

Additional bibliography: Mold., *Phytologia* 44: 409--410. 1979; Mold., *Phytol. Mem.* 2: 217 & 589. 1980.

VITEX CUSPIDATA Hiern

Additional bibliography: Mold., *Phytologia* 44: 410. 1979; Mold.,

Phytol. Mem. 2: 217, 221, 234, & 589. 1980.

VITEX CYMOSA Bert.

Additional bibliography: Mold., Phytologia 45: 482 (1980) and 46: 35, 38, & 39. 1980; Mold., Phytol. Mem. 2: 84, 102, 112, 121, 136, 171, 176, 179, 193, 366, & 589. 1980.

Recent collectors refer to this plant as a sun-loving shrub or large tree, 3--40 m. tall, almost leafless when in anthesis, the trunk somewhat fluted, the bark somewhat striate vertically, the flower-buds lilac, and the [immature] fruit green, and have found it growing at 380 m. altitude, flowering and fruiting in October, in anthesis also in November. The corollas are said to have been "whitish" on Araujo & Maciel 4033.

Additional citations: PERU: Madre de Dios: Gentry, Aronson, & Ramírez 26800 (ld). Tumbes: Schunke Vigo 2413 (W--2865776). BRAZIL: Pará: Silva & Rosário 3828 (N). Rio de Janeiro: Araujo & Maciel 4033 (Fe--17881).

VITEX DEGENERIANA Mold.

Additional bibliography: Mold., Phytologia 44: 412. 1979; Mold., Phytol. Mem. 2: 171 & 589. 1980.

VITEX DENTATA Klotzsch

Additional bibliography: Peters, Naturwiss. Reise Mossamb. 6 (1): 265--266. 1861; Pritz., Thes. Lit. Bot., imp. 1, 245. 1872; Stafleu, Tax. Lit. 355--356. 1967; Pritz., Thes. Lit. Bot., imp. 2, 245. 1972; Mold., Phytologia 44: 413. 1979; Mold., Phytol. Mem. 2: 241 & 589. 1980.

VITEX DINKLAGEI Gürke

Additional bibliography: Mold., Phytologia 44: 413. 1979; Mold., Phytol. Mem. 2: 215 & 589. 1980.

VITEX DIVARICATA Sw.

Additional bibliography: Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 296--297 (1888) and ed. 2, 3: 296--297. 1937; Mold., Phytologia 45: 482. 1980; Mold., Phytol. Mem. 2: 94, 96, 98, 99, 101, 103, 104, 112, 121, 366, 457, 459, 460, & 589. 1980.

Howard describes this plant as a tree, 20 feet tall, the trunk 5 inches in diameter at breast height, the immature fruit green in August.

The Null & Scully 130, distributed as *V. divaricata*, actually is *V. parviflora* A. L. Juss.

Additional citations: PUERTO RICO: Howard 16646 (W--2891989).

VITEX DONIANA Sweet

Additional & emended bibliography: G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Kong. Exped. Bot. 2 (2): 273--274. 1916; Mold., Phytologia 45: 482--483, 486, & 487 (1980) and 46: 22 & 30. 1980; Mold., Phytol. Mem. 2: 91, 200--202, 205--207, 209--213, 215--217, 221, 223, 224, 228, 229, 231, 234, 236, 239, 241, 247, 251, 366, 369, 457, & 589--590. 1980.

Fries (1916) notes that this is a "Bis 15 m hoher Baum, etwas an *Aesculus* erinnernd. Die neuen Blätter waren beim Einsammeln (d/ 20. Sept.) gerade ausgewachsen, die der vorigen Vegetationsperiode abgefallen. Die Blüten waren noch nicht völlig entwickelt, die Infloreszenzen jedoch ausgewachsen....Bei Bwana Mkubwa in Nordwest-Rhodesia wurde eine an *V. Cienkowskii* erinnernde, wahrscheinlich unbeschriebene Art gefunden (n. 447). Das Material war ziemlich unvollständig, da Blüten fehlten. Ende August trug nämlich die Pflanze nur die pflaumenähnlichen schwarzen Früchte. Die Blätter waren 3- oder gewöhnlich 5-zählig, die Blättchen gestielt, kahl, umgekehrt eiförmig und durch eine abgesetzte kurze Spitze besonders charakterisiert."

Additional citations: SIERRA LEONE: *G. Don s.n.* [Mo. Bot. Gard. photo A.851] (Go--photo of type, Z--photo of type).

VITEX EXCELSA Mold.

Additional bibliography: Mold., *Phytologia* 45: 483. 1980; Mold., *Phytol. Mem.* 2: 136, 171, & 590. 1980.

Recent collectors describe this species as a tree, 5 m. tall, the leaves pilose, and the immature fruit green and velutinous, and have found it in fruit in December. Material has been misidentified and distributed in some herbaria as *V. flavens* H.B.K.

Additional citations: BRAZIL: Pará: *Vilhena, Lobo, & Ribeiro* 176 (N).

VITEX FLAVENS H.B.K.

Additional bibliography: Mold., *Phytologia* 45: 483. 1980; Mold., *Phytol. Mem.* 2: 84, 112, 130, 136, 171, & 590. 1980.

The *Vilhena, Lobo, & Ribeiro* 176, distributed as *V. flavens*, actually is *V. excelsa* Mold.

VITEX GAMOSEPALA W. Griff.

Additional & emended bibliography: E. D. Merr., *Bibl. Enum. Born.* Pl. 5: 514. 1921; Fletcher, *Kew Bull. Misc. Inf.* 1938: 405, 407, 432, & 436--437. 1938; Mold., *Phytologia* 44: 486--488 (1979) and 46: 483. 1980; Mold., *Phytol. Mem.* 2: 287, 297, 319, 458, 460, & 590. 1980.

Fletcher (1938) cites only *Kerr* 440 and *Lakshnakara* 695 from Thailand, asserting that the type of the species was collected in Malacca and that the species occurs also in Borneo and Sumatra.

VITEX GAUMERI Greenm.

Additional bibliography: Mold., *Phytologia* 44: 489--492. 1979; Mold., *Phytol. Mem.* 2: 69, 73, 75, 77, 80, 366, 458, & 590. 1980; Seymour, *Phytol. Mem.* 1: 246. 1980.

Recent collectors describe this plant as an abundant tree, 15 m. tall, with fragrant flowers, and have found it growing along roadsides, in gallery forests, and among metamorphic rocks on river floodplains, at 300--820 m. altitude, flowering in July, and fruiting in August. The corollas are said to have been "blue-purple" on *Stevens* 9324 and "violet" on *Calzada* 2317. *Calzada* reports the vernacular name variant, "ya-axnik".

The *Blanco, Toledo, & Cabrera 530*, distributed as *V. gaumeri*, actually is *V. pyramidata* B. L. Robinson.

Additional citations: MEXICO: Tabasco: *Calzada 2317* (Me--270117). Yucatán: *Butterwick 287* (Ld), *297* (Ld). NICARAGUA: Boaco: *W. D. Stevens 9324* (Ld). Estelí: *W. D. Stevens 9943* (Ld). Nueva Segovia: *W. D. Stevens 3352* (Z).

VITEX GIGANTEA H.B.K.

Additional & emended bibliography: G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Mold., Phytologia 45: 483. 1980; Mold., Phytol. Mem. 2: 130, 136, 366, 458, & 590. 1980.

Dodson and his associates describe this species as a tree, 15 m. tall, the corollas "dark-blue with a white throat" and found it in anthesis in October.

Additional citations: ECUADOR: El Oro: *Escobar 804* (Au). Los Ríos: *Dodson, Gentry, & Valverde 8754* (N). Tumbes: *Vargas Alvarez 1* (W--2865959), *32* (W--2865960).

VITEX GLABRATA R. Br.

Additional & emended bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 405, 432, & 435--436. 1938; Fosberg, Sachet, & Oliver, Micronesica 15: 239. 1979; Fosberg, Otobed, Sachet, Oliver, Powell, & Canfield, Vasc. Pl. Palau 38. 1980; Mold., Phytologia 45: 483--484 (1980), 46: 483 (1980), and 47: 21. 1980; Mold., Phytol. Mem. 2: 24, 266, 271, 274, 287, 289, 290, 294, 297, 309, 310, 319, 321, 323, 328, 339, 366, 457--460, & 590. 1980.

Recent collectors have found this plant growing in scrub on riverbanks, in scrub jungles, mixed deciduous forests, evergreen and dry evergreen forests, the edges of evergreen forests, and hedgerows. from 2--330 m. altitude, in fruit in March. Lazerides found it "occasional in black alluvial soil with *Eucalyptus papuana*, *Brachyachne convergens*, *Terminalia*, and *Hakea arborescens*.

Fletcher (1938) cites from Thailand the following collections: *Collins 165 & 1217*, *Kerr 3369, 4391, 6031, 6156, 7748, 15211, 15370, 17103, & 19121*, *Lakshnakara 960*, *Noe 202*, *Put 1612*, *Rabil 383*, and *Vanpruk 725*; also *Marcan 1722 & 2086* probably cultivated. He notes that the type of the species is from Northern Australia, but lists the species also from Indochina, Malaya, and New Guinea. He includes "*V. leucoxydon* Linn." in the sense as used by Kurz, in its synonymy.

Additional citations: NEW GUINEA: West Irian: *Schram BW.7986* (Me--264199). AUSTRALIA: Northern Territory: *Lazerides 7986* (W--2910882).

VITEX GRANDIFOLIA Gürke

Additional bibliography: Mold., Phytologia 45: 485--487 (1980) and 46: 40. 1980; Mold., Phytol. Mem. 2: 207, 209--211, 213, 215, 216, 366, & 590. 1980.

According to a note appended to the label accompanying the collection, seed was gathered from the *Baldwin 14818* collection in Liberia to be grown at Williamsburg, Virginia.

Additional citations: LIBERIA: *Baldwin 14818* (W--2070224).

VITEX GRISEA J. G. Baker

Additional bibliography: Mold., *Phytologia* 45: 487--488. 1980; Mold., *Phytol. Mem.* 2: 228, 234, & 590. 1980.

Additional citations: ANGOLA: Huila: *Welwitsch* 5759 [Mo. Bot. Gard. photo 2997] (Go--photo of type).

VITEX GUERKEANA Hiern

Additional bibliography: Mold., *Phytologia* 45: 488. 1980: Mold., *Phytol. Mem.* 2: 234 & 590. 1980.

Additional citations: ANGOLA: Cuanza Norte: *Welwitsch* 5632 [Mo. Bot. Gard. photo 2995] (Go--photo of type).

VITEX HAVILANDII Ridl.

Additional bibliography: Mold., *Phytologia* 45: 490 (1980) and 47: 31 & 39. 1980; Mold., *Phytol. Mem.* 2: 319 & 590. 1980.

VITEX HAYNGA Roxb.

Additional & emended bibliography: Roxb., *Hort. Beng.*, imp. 1, 46 (1814) and imp. 2, 46. 1980; Mold., *Phytologia* 45: 490. 1980; Mold., *Phytol. Mem.* 2: 266, 366, & 590. 1980.

VITEX HEMSLEYI Briq.

Additional bibliography: Mold., *Phytologia* 45: 490--491 (1980) and 46: 11. 1980; Mold., *Phytol. Mem.* 2: 69, 80, & 590. 1980.

Vincelli describes this plant as a shrub, 3 m. tall, and found it growing along a river in mangrove swamps, at altitudes of sea-level to 10 m., in flower in June. The corollas on his collection (cited below) are described as having been "violet" in color when fresh.

Additional citations: MEXICO: Jalisco: A. Pérez 1846 (Me--270080). NICARAGUA: Zelaya: *Vincelli* 669 (Z).

VITEX KLUGII Mold.

Additional bibliography: Mold., *Phytologia* 45: 495. 1980; Mold., *Phytol. Mem.* 2: 112, 121, 136, 171, & 591. 1980.

Recent collectors refer to this species as a slender tree, 10--20 m. tall, the trunk 3 inches in diameter at breast height, and the fruit blackish. They have found it growing in upland white sand and mostly in white sand in non-inundated forests (*terra firme*), at 140 m. altitude, flowering and fruiting in March. The corollas are said to have been "blue" on *Gentry* & al. 26134.

Additional citations: PERU: Loreto: *Gentry, Díaz, Aronson, & Jaramillo* 25873 (Ld), 26134 (Z).

VITEX KUYLENII Standl.

Additional bibliography: Mold., *Phytologia* 46: 10--11. 1980; Mold., *Phytol. Mem.* 2: 69, 73, 75, 77, 80, & 591. 1980; Seymour, *Phytol. Mem.* 1: 246. 1980.

Recent collectors describe this plant as a tree, 8--11 m. tall, and have encountered it in thickly wooded ravines with brooks on pine savannas, at 10--20 m. altitude, in flower in August, and in fruit in June. The corollas are said to have been "blue" on *Dwyer*

12842.

Additional citations: GUATEMALA: Izabal: Jones & Facey 3500 (Me--116923); Jones, Proctor, & Facey 3031 (Me--116924). BELIZE: Dwyer 12842 (Ws). NICARAGUA: Zelaya: Vincelli 545 (Z).

VITEX KWEICHOWENSIS P'ei

Additional bibliography: Chun, Sinensia 4: 268. 1940; Mold., Phytologia 46: 11. 1980; Mold., Phytol. Mem. 2: 280 & 591. 1980.

VITEX LANIGERA Schau.

Additional bibliography: Mold., Phytologia 46: 11--12. 1980; Mold., Phytol. Mem. 2: 252, 458, & 591. 1980.

Gentry encountered this species in cloud-forests and forest remnants in ravines, at 2500 m. altitude, fruiting in May, and describes it as a tree, 8--10 m. tall, the fruit at first green, then brown.

Additional citations: MADAGASCAR: A. Gentry 11640 (E--2737772), 11815 (E--2737593); Hilsenberg & Bojer s.n. [Mo. Bot. Gard. photo A.862] (Go--photo, Z--photo).

VITEX LEUCOXYLON L. f.

Additional & emended bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; Roxb., Fl. Ind., ed. 2, imp. 1, 74--75 (1832) and ed. 2, imp. 2, 483. 1874; Brandis, Forest Fl. N-W. Cent. India 370. 1874; Funke, Ann. Jard. Bot. Buitenz. 41: 55. 1930; Roxb., Fl. Ind., ed. 2, imp. 3, 483. 1971; Hocking, Excerpt. Bot. A.23: 389. 1974; Mold., Phytologia 46: 12--20 & 41. 1980; Mold., Phytol. Mem. 2: 256, 266, 269, 274, 297, 319, 366, 458, 460, & 591. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980.

Additional citations: SRI LANKA: Meijer & Jayasuriya 1314 (W--2867464).

VITEX LEUCOXYLON f. *SALIGNA* (Roxb.) Mold.

Emended synonymy: *Vitex saligna* Roxb., Hort. Beng., imp. 1, 46. 1814; Fl. Ind., ed. 2, imp. 1, 3: 75. 1832.

Additional & emended bibliography: Roxb., Hort. Beng., imp. 1, 46. 1814; Roxb., Fl. Ind., ed. 2, imp. 1, 3: 75 (1832) and ed. 2, imp. 2, 483. 1874; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 1: 634. 1908; Mold., Phytologia 46: 17--19. 1980; Mold., Phytol. Mem. 2: 266, 366, 460, & 591. 1980; Roxb., Hort. Beng., imp. 2, 46. 1980.

VITEX LEUCOXYLON f. *ZEYLANICA* (Mold.) Mold.

Additional bibliography: Hocking, Excerpt. Bot. A.23: 389. 1974; Mold., Phytologia 46: 17 & 19--20. 1980; Mold., Phytol. Mem. 2: 266, 269, 458, & 591. 1980.

VITEX LIMONIFOLIA Wall.

Additional & emended bibliography: Fletcher, Kew Bull. Misc. Inf.: 1938: 405, 431, & 433. 1938; Mold., Phytologia 46: 20--21. 1980; Mold., Phytol. Mem. 2: 266, 274, 287, 289, 290, 366, & 591. 1980.

Recent collectors have encountered this plant in open woods and open deciduous forests, at 15--300 m. altitude. Mrs. Collins reports that in Thailand its wood is used to make house-posts.

Fletcher (1938) notes that the nomenclatural type of the species is from the Promé hills of Burma, lists the species also from Laos and Cambodia, and cites *Collins 9*, *Kerr 2011 & 19488*, *Kiah 24414*, *Marcan 367 & 1102*, and *Vanpruk 184 & 1009* from Thailand.

VITEX LINDENI Hook. f.

Additional & emended bibliography: Bean in Chittenden, Dict. Gard., imp. 1, 4: 2249 (1956) and imp. 2, 4: 2249. 1965; Mold., Phytologia 46: 21. 1980; Mold., Phytol. Mem. 2: 366 & 591. 1980.

VITEX LONGISEPALA King & Gamble

Additional & emended bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 405, 407, 432, & 436. 1938; Mold., Phytologia 46: 22. 1980; Mold., Phytol. Mem. 2: 287, 298, & 591. 1980.

Recent collectors refer to this plant as a scandent shrub and have encountered it in evergreen forests, at 100--210 m. altitude. Fletcher (1938), noting that the type of the species is from the Malay Peninsula, cites only *Kerr 7113*, *Kiah 24275*, and *Lakshnaka 634* from Thailand.

VITEX LUCENS T. Kirk

Additional & emended bibliography: Laing & Blackwell, Pl. N. Zeal., ed. 1, 350--351 & 456, fig. 114. 1906; Cheeseman, Man. N. Zeal. Fl., ed. 2, 763--764 & 1163. 1926; Laing & Blackwell, Pl. N. Zeal., ed. 3, 286, 354--356, & 468, fig. 127 (1927), ed. 4, 221, 372, & 499, fig. 127 (1940), and ed. 7, 221, 371--373, & 499, fig. 139. 1964; Mold., Phytologia 46: 23--28. 1980; Mold., Phytol. Mem. 2: 340, 366, 458, & 591. 1980.

Emended illustrations: Laing & Blackwell, Pl. N. Zeal., ed. 1, 351, fig. 114 (1906), ed. 3, 355, fig. 127 (1927), ed. 4, 372, fig. 139 (1940), and ed. 7, 372, fig. 139. 1964.

Hooker (1853) reports the vernacular name, "kanere", and cites *Banks & Solander* and *Colenso s.n.* He notes that the species is "Rare in the Middle Island" and is cultivated in England.

Additional citations: NEW ZEALAND: North: *B. H. Macmillan 69/89* (Ne--33952). MOUNTED ILLUSTRATIONS: Laing & Blackwell, Pl. N. Zeal., ed. 1, 351, fig. 114. 1906 (Z).

VITEX MADIENSIS var. *MILANJIENSIS* (Britten) Pieper

Additional bibliography: Mold., Phytologia 46: 30--31. 1980; Mold., Phytol. Mem. 2: 221, 223, 228, 234, 236, 239, 241, & 591. 1980.

Reekmans has encountered this plant at 1600--1800 m. altitude, flowering in February and October. The corollas are said to have been "whitish" on his no. 7211 and "white, lower lip violet" on his no. 5765.

Additional citations: BURUNDI: *Reekmans 5765*(Ac), 7211 (Ac).

VITEX MEGAPOTAMICA (Spreng.) Mold.

Additional bibliography: Baill., Hist. Pl. 11: 94. 1891; Dombrowski & Neto, Inform. Pesq. 3 (21): 80 & 81. 1979; Klein, Selowia 31: 163. 1979; Mold., Phytologia 46: 31--38. 1980; Mold., Phytol. Mem. 2: 171, 180, 181, 193, 366, 435, 458--460, & 592. 1980.

Dombrowski & Neto (1979) describe this species as a tree to 5 m. tall, with lilac-colored corollas, blooming in December and January, known locally as "tarumã", and used to make "obras externas, esteios, moirões, postes, carrocerias, mobílias dormentes de primeira qualidade". Renvoize describes it as a slender tree, 8--20 m. tall, the trunk smooth or the bark flaking off in vertical strips, gray, the leaves bright glossy-green above, and the corollas "grayish-white, violet in the throat" (no. 3204) or "white, the dorsal lobe pale-mauve, the throat with mauve streaks, pilose on the upper lip, the stamens deep-mauve" (no. 3259), and has encountered it growing at 175--200 m. altitude, in anthesis in October.

Additional citations: ARGENTINA: Misiones: Renvoize 3204 (W--2894513), 3259 (W--2894514).

VITEX MICRANTHA Glürke

Additional bibliography: Mold., Phytologia 46: 39. 1980; Mold., Phytol. Mem. 2: 209--211, 215, 458, & 592. 1980.

Bernardi describes this plant as a tree, 4--10 m. tall.

Additional citations: IVORY COAST: Bernardi 8456 (W--2866289).

VITEX MOLLIS H.B.K.

Additional bibliography: Mold., Phytologia 46: 40--43. 1980; Mold., Phytol. Mem. 2: 69, 366, 458, 459, & 592. 1980; Wiggins, Fl. Baja Calif. 525 & 535, fig. 503. 1980.

Additional illustrations: Wiggins, Fl. Baja Calif. 535, fig. 503. 1980.

Recent collectors describe this species as a wide-spreading tree, 12 m. tall, and have found it growing in low deciduous woods, at 430--1100 m. altitude, reporting the vernacular name, "nanche de perro". The corollas are said to have been "blue" on Boutin & Brandt 2666.

Additional citations: MEXICO: Guerrero: Blanco, Toledo, & Cabrera 538 (Me--276341). Jalisco: Boutin & Brandt 2666 (Me--270698). Michoacán: Egger 166 (Ws).

VITEX MOMBASSAE Vatke

Additional & emended bibliography: J. B. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 316, 321, 326, & 521. 1900; R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Kong. Exped. Bot. 2 (2): 273. 1916; Fedde & Schust., Justs Bot. Jahresber. 42: 252. 1920; Good & Exell, Journ. Bot. 68: Suppl. 144. 1930; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 403. 1938; Moomaw, Study Pl. Ecol. Coast Kenya 41. 1960; Dale & Greenway, Kenya Trees Shrubs 593 & 597. 1961; Friedrich-Holzhammer, Meewe, & Meikle, Prodr. Fl. Südw. Afr. 13, 122: 10. 1967; Astle, Kirkia 7: 92. 1968; Mold.,

Phytologia 17: 12. 1968; Richards & Morony, Check List Fl. Mbala 239--240. 1969; Gillett, Numb. Check-list Trees Kenya 47. 1970; Mold., Fifth Summ. 1: 232, 238, 240, 242, 245, 247, 249, 250, & 253 (1971) and 2: 717, 718, 722, 727, & 927. 1971; Greenway & Vesey-Fitzgerald, Journ. E. Afr. Nat. Hist. Soc. Nat. Mus. 28: 21. 1972; Palmer & Pitman, Trees South. Afr., ed. 2, 3: 1950, 1951, & 1957. 1972; Mold., Phytologia 34: 262. 1976; Lawton, Journ. Ecol. 66: 183. 1978; Mold., Phytologia 44: 390. 1979; Mold., Phytol. Mem. 2: 221, 228, 230, 231, 235, 236, 238, 239, 242, 243, & 592. 1980.

Lawton (1978) lists this species as a member of the *chipya* ecological group of species growing in an open habitat where dry season fires are intense. Palmer & Pitman (1972) assert that it is, along with *V. amboniensis* Gürke and *V. harveyana* H. H. W. Pearson, a species which grows well in northeastern Namibia. They describe it as a shrub or tree of savannas and open forests, partial to sandy soil, to 6 m. tall, often many-branched from the base, with smooth gray bark and hairy young twigs, having long-petiolate leaves composed of 3--5 leaflets which are slightly hairy above, densely velutinous beneath, marginally dentate or entire, and sessile or subsessile, the central one to 7.5 cm. long and 1.9 cm. wide, "egg-shaped, oval, or oblong", apically rounded or "pointed". The flowers are described as borne in cymes on long stalks [peduncles] in the axils of the leaves, the corollas mauve, violet, or bicolored, the fruit "about the size of a cherry", with a "hard stone and a thin, fleshy covering", black when mature, and edible. They report the common name, "wild cherry".

Greenway & Vesey-Fitzgerald (1972) refer to the species as a small tree of rocky hillsides, fire subclimax, and open woodland in Lake Manyara National Park, citing their no. 6001. Astle (1968) cites his no. 283 from Zambia. Friedrich-Holzhammer and his associates (1967) cite DeWinter & Marais 4796 and Watt 17 from Namibia. Apparently they accept *V. flavescens* Rolfe as distinct from *V. mombassae*.

Richards & Morony (1969) found *V. mombassae* to be a "fairly large spreading tree", 20 feet tall, growing in open, very rocky, sandy areas, on rough stony slopes, steep roadsides, and among flat laterite rocks, at 2600--5800 feet altitude, citing their nos. 2309, 11846, 11914, 13300, 13574, & 18169 and Robertson 180 from Mbala.

Watts & Breyer-Brandwijk (1962) report that the sap of this tree "is caustic and may on occasion cause severe swelling and pain, but is applied by native boys in Zambia 'to make the penis grow bigger'. In Tanzania a decoction of the plant is used for 'strengthening and flavouring tobacco.'" They also report the fruit is edible and list the following vernacular names: "kashilumbulu", "mfulu", "mfuru", "mfutu", "mkakata", "mkinka", "mpura", "msungwa", "msungwe", "msungwi", "mtalali", "mubonya", "muchunkule", "muhunda", "mumbomba", "mumbomba-wacilunga", "muninka", "umchunkale", and "umtshonge".

Dale & Greenway (1961) describe the species as a "small savanna tree to 20 ft. with densely pubescent branchlets. Leaves coriaceous

and 3--5-foliolate with petiole 1/2 to 4 in. long. Leaflets ob-ovate, elliptic or oblong-elliptic to 3 in. long and 1 3/4 in. broad, apex rounded to acute or shortly cuspidate, entire and sessile or very shortly petiolulate, lamina thinly pubescent above and densely so beneath. Flowers in few-flowered axillary cymes on peduncles 2 1/2 in. long; bracts lanceolate or oblanceolate. Corolla twice as long as the calyx, white with one mauve lobe or all mauve. Ovary hairy. Drupes black, the size of a plum." They describe it as a resident of coastal savannas in Kenya, citing *Drummond & Hemsley 1156*, *Gardner 1464*, and *Hildebrandt 1872* (the type). They record the vernacular names: "mfududu", "mfudumaji", "mfudukoma", "mkalijote", and "mkufu".

Moomaw (1960) encountered the tree in wooded portions of savannas in coastal Kenya. Good & Exell (1930) refer to it as a shrub or tree 10--25 feet tall growing in thickets especially comprised of *Combretaceae* (*Combretum*, *Diplorhynchus*, etc.) and "sporadic in open forests of *Combretum*" in Angola, citing their nos. 1052, 1053, 1063, and 1064, listing "muxiluxillu" as a vernacular name.

Fries (1916) calls the species a "Niedriger Baum oder Strauch in den Trockenwäldern [in Zambia]. Ende September in beginnender Blüte; der grösste Lappen der Blütenkrone blau, die vier kleineren nellblau. -- Die Art ist bisher aus Angola und dem unteren Kongo angegeben", citing his no. 832. Gürke (1895) calls it a shrub to 4 m. tall, inhabiting the "Buschsteppe" of East Africa.

Recent collectors refer to *Vitex mombassae* as a hairy shrub, shrublet, or small tree, 2--8 m. tall, single-stemmed, much branched, the trunk to 12 inches in diameter, the bark yellowish-gray and smooth or corrugated, the sap colorless, the leaves tomentose, the flowers small, aromatic, paniced, and the immature fruit large, green [the 12-inch trunk diameter seems questionable -- probably "in circumference" was intended]. They have found it growing in deep coarse sand, red sandy soil, or orange-brown sandy loam in sandy thickets, open woods, *Brachystegia* woodland, and grassveld, as well as in stony ground in the bush, at 50--1970 m. altitude, in anthesis from September to December, as well as in March and May, and in fruit in February and June. It is reported "local with *Schrebera koiloneura* and *Combretum purpureiflorum* in woodland of *Commiphora ugogensis*, *C. molle*, *C. mossambicensis*, *Combretum apiculatum*, *Strophanthus eminii*, *Xeroderris stuhlmannii*, *Grewia* spp., *Markhamia* spp., *Euphorbia matabelensis*, *Dalbergia aberrans*, *Entandrophragma bussei*, and *Sesamothamnus busseanus*."

The corollas are said to have been "mauve" on *Tanner 2523*, "purple & mauve" on *Tanner 1245*, "mauve & white" on *Tanner 2826*, "light blue-lilac" on *Schlieben 5353*, "white to light-blue" on *Mwasumbi 10292*, and "hood & sides of lobes white, lip light-mauve" on *Greenway & Kanuri 14688*.

"Chella" is the name applied to this plant by the Bushmen, according to Watt, who, strangely, refers to the fruit as "inedible". Collectors also report the local name, "mushembere", from Namibia

and, from Tanzania, the names, "mfuu mwengere", "mutalali", and "sungwi".

Richards describes the leaves as "5-lobed. soft, but they are compound, not simple and lobed, although the leaflets may be sessile or subsessile). Greenway & Kanuri call the "leaves peltate", but this, also, is not true.

According to Tanner, in Tanzania the species is found in cultivated areas as a residual tree, left standing because of its edible fruit. He also asserts that the pounded roots are used in the treatment of snakebite to cause vomiting, also mixed with butter placed in cuts on the temples "and to close the fontanelle on newly born infants".

Vitex mombassae is easily confused with *V. payos* (Lour.) Merr., but may be distinguished from the latter by its much larger flowers and the pubescence in the inflorescence being yellowish-brown instead of white.

Material of *V. mombassae* has been misidentified and distributed in some herbaria as *V. amboniensis* Gürke, *V. shirensis* J. G. Baker, and even as *Torenia mannii* Skan. On the other hand, the Harris 2827 and Lemboko 26, distributed as *V. mombassae*, actually are *V. payos* var. *glabrescens* (Pieper) Mold. and Holst 2096 is *Premna chrysocarpa* (Bojer) Gürke.

Additional citations: TANZANIA: Tanganyika: Carnochan 69 (W--2091735); Greenway & Kanuri 14688 (Mu); Mwasumbi 10292 (Ld); Pole-Evans 778 (W--1940928); Schlieben 1477 (Mu), 5353 (Mu); Tanner 1245 (N), 2523 (N), 2826 (Ba, N). ZAMBIA: Gilges 671 (Mu); M. Richards 21442 (E--1836521); E. A. Robinson 3786 (Mu), 3940 (Mu). ZIMBABWE: G. M. McGregor 72/51 [Govt. Herb. 34662] (N). MALAWI: J. Buchanan 231 (W--806745). NAMIBIA: Baum 298 (Mu--3914); Winter & Marais 4796 (Mu). LOCALITY OF COLLECTION UNDETERMINED: Watt 17 [W. Caprivi] (Mu).

VITEX MOMBASSAE var. *ACUMINATA* Pieper

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 403. 1938; Dale & Greenway, Kenya Trees Shrubs 597. 1961; Mold., Phytologia 15: 267. 1967; Mold., Fifth Summ. 1: 242 (1971) and 2: 927. 1971; Mold., Phytol. Mem. 2: 231 & 592. 1980.

VITEX MOMBASSAE var. *ERYTHROCARPA* (Gürke) Pieper

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 403. 1938; Mold., Phytologia 15: 267. 1967; Mold., Fifth Summ. 1: 247 (1971) and 2: 717 & 927. 1971; Mold., Phytologia 25: 416. 1973; Mold., Phytol. Mem. 2: 236 & 592. 1980.

VITEX MOMBASSAE var. *PARVIFLORA* (Gibbs) Pieper

Additional bibliography: Mold., Phytologia 15: 267. 1967; Mold., Fifth Summ. 1: 249 (1971) and 2: 717, 722, & 927. 1971; Mold., Phytol. Mem. 2: 238 & 592. 1980.

Additional citations: ZIMBABWE: Gibbs 135 [Mo. Bot. Gard. photo A.855] (Go--photo of type, N--photo of type, W--photo of type, Z--photo of type).

VITEX MORONENSIS Mold., Phytologia 34: 246. 1976.

Bibliography: Mold., Phytologia 34: 246 & 257. 1976; López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 33. 1979; Mold., Phytologia 44: 398. 1979; Mold., Phytol. Mem. 2: 130 & 592. 1980.

Citations: ECUADOR: Morona Santiago: Little, Ortega U., Samaniego V., & Vivar C. 548 (Z--type).

VITEX MOSSAMBICENSIS Gürke

Synonymy: *Vitex mossamicensis* Pieper ex Mold., Résumé 387, sphalm. 1959.

Additional & emended bibliography: J. G. Baker in Thiselt.-Dyer, Fl. Trop. Afr. 5: 317 & 329. 1900; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; Mold., Résumé 145, 151, 387, & 477. 1959; Mold., Phytologia 15: 267. 1967; Mold., Fifth Summ. 1: 239 & 253 (1971) and 2: 927 & 973. 1971; Mold., Phytologia 44: 393. 1979; Mold., Phytol. Mem. 2: 228, 242, 459, & 592. 1980.

Gürke (1895) notes that "Siese Art fällt besonders auf durch die an der Unterseite in den Winkeln der Adern gebärteten Bl[ät-ter] und die stark lippenförmige, mit kurzem, breiten Tubus versehene B[lutenkrone]."

Baker (1900) cites only the type collection from Mozambique. Recent collectors describe the plant as a tall tree, 3--16 m. tall, with tomentose 5-digitate leaves on long hairy petioles, the petiolules 9--10 mm. long, axillary, subterminal, lax panicles, "fused sepals", and long-"pedicellate" fruit "with a slight smell", and have encountered it scattered in dense coastal thickets, at 90--280 m. altitude, in fruit in January. The corollas are said to have been "steel-blue" on Schlieben 5792.

Material of *V. mossambicensis* has been misidentified and distributed in some herbaria as *V. buchananii* J. G. Baker.

Additional citations: TANZANIA: Tanganyika: B. J. Harris 6180 (Z); Ludanga MRC.1180 (Tz); Schlieben 5792 (Mu).

VITEX MOSSAMBICENSIS var. *OLIGANTHA* (J. G. Baker) Pieper

Additional synonymy: *Vitex mossamicensis* var. *oligantha* (J. G. Baker) Pieper ex Mold., Résumé 387, sphalm. 1959.

Additional bibliography: Fedde & Schust., Justs Bot. Jahresber. 57 (2): 402. 1938; Mold., Phytologia 15: 267. 1967; Mold., Fifth Summ. 1: 239 (1971) and 2: 722, 724, 927, & 973. 1971; Mold., Phytol. Mem. 2: 228, 459, & 592. 1980.

VITEX NEGUNDO L.

Additional & emended synonymy: *Negundo arbor mas* J. Bauhin, Hist. Pl. Univers. 2: 189. 1651. *Negundo arbor femina* J. Bauhin, Hist. Pl. Univers. 2: 189. 1651. *Vitex trifolia odorata*, *silvestris indica* P. Herm. ex Breyn., Prod. Fasc. Rar. Pl., ed. 1, 2: 106, in syn. 1688. *Vitex trifolia minor indica serrata* Breyn., Prod. Fasc. Rar. Pl., ed. 1, 2: 106. 1688. *Vitex trifolia odorata silvestris indica* P. Herm., Mus. Zeyl., ed. 2, 47. 1726. *Vitex trifolia major* Rauwolf ex P. Herm., Mus. Zeyl., ed. 2, 47. 1726. *Walnika* P. Herm., Mus. Zeyl., ed. 2, 47. 1726. *Negundo prior*, *sive mas*; *Acostae* Breyn., Prod. Fasc. Rar. Pl., ed. 2, 2:

106, in syn. 1739. *Lagondium litoreum* Rumpf, Herb. Amboin. 4: 50, pl. 19. 1743. *Negundo femina* Acosta ex L., Fl. Zeyl., imp. 1, 194. 1747. *Vitex trifolia odorata sylvestris indica* Burm. ex L., Fl. Zeyl., imp. 1, 194. 1747. *Negundo mas* Acosta ex L., Fl. Zeyl., imp. 1, 195. 1747. *Vitex foliis quinatis ternatisque serratis, floribus racemoso-paniculatis* L. ex P. Browne in Sloane, Civil Nat. Hist. Jamaic., ed. 1, 267, in syn. 1756. *Vitex trifolia indica minor serrata* Pluk. ex Burm. f., Fl. Ind. 138, in syn. 1768. *Vitex trifolia sylvestris indica odorata* Burm. f., Fl. Ind. 138, in syn. 1768. *Lagondium littoreum* Rumpf apud Burm. f., Fl. Ind. 138, in syn. 1768. *Vitex foliis quinatis, ternatisque serratis, floribus racemoso-paniculatis* L. apud Burm. f., Fl. Ind. 138. 1768. *Bem-noss* Rheede apud Decne., Nouv. Ann. Mus. Hist. Nat. Paris 3: 400, in syn. 1834. *Vitex leucoxylon* Blanco, Fl. Filip., ed. 1, 516. 1837. *Vitex trifoliata odorata sylvestris indica* Burm. apud Decne., Nouv. Ann. Mus. Hist. Nat. Paris 3: 400, in syn. 1834. *Vitex negundo* Roxb. ex Buek, Gen. Spec. Syn. Candoll. 3: 502, in syn. 1858. *Lagundi* Mercado ex Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: 160, in syn. 1880. *Vitex uegundo* L. ex Razi, Journ. Univ. Poona 1 (2): Biol. 47, sphalm. 1952. *Vitex negungo* Hyland, U. S. Dept. Agr. Pl. Invent. 173: 272, sphalm. 1969. *Vitex nugundo* L. ex Tilak & Kale, Sydowia Ann. Mycol. 23: 17, sphalm. 1969. *Vitex negundo* var. *negundo* [L.] apud Encke & Buchheim in Zander, Handwörterb. Pfl.-namen, ed. 10, 525. 1972. *Vitex negundu* L. ex Vohora, Khan, & Afaq, Indian Journ. Pharm. 35: 100 & 101, sphalm. 1973. *Vito negundo* Humar, Hindustani Times Feb. 17, p. 4, sphalm. 1974. *Nika silvestris* P. Herm. ex Mold., Phytologia 31: 403, in syn. 1975. *Vitex nigundo* Patunkar, Grasses Marathwada 297, sphalm. 1980.

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Sweet (1826, 1830) and Loudon (1832) state that this species was introduced into cultivation in England from the "East Indies" in 1759, but Don (1839) gives the date as 1812; Bean (1956) asserts that it has been in cultivation in England since 1697.

Meyer (1976) informs us that seeds of *Vitex negundo* were sent from northern China by Pierre d'Incarville (1706--1757) to Prof. Krasheninnikow in Leningrad and to Bernard de Jussieu in Paris and that the species was "previously unknown in Europe". Fletcher (1972) claims that it was introduced into cultivation from China "about 1697".

Common and vernacular names recently reported for the species include "aggia-chita", "agnocasto", "ai toeban", "ash-leaved chaste-tree", "baimat", "bana", "ban-muichi", "begunia", "cardenillo", "chaste tree", "Chinese chaste tree", "ching tau", "ch'u", "gattilier", "helarika", "hing-rain", "huang-ching", "huang chin k'otau", "Indian privet", "indrani", "indrani", "kari nagal", "katri", "lagoendi laot laki-laki", "lagunde", "lagundi", "la gum", "leban", "lenggundi", "lingur", "malawin", "man-ching", "marwan", "mâu kinh", "m-kiaⁿ-keng", "m-kiaⁿ-tê", "mewari", "midaki", "nagod", "nagoda", "nagot", "nalla nochi", "negundo", "negundo chaste-tree", "nengar", "newri", "ngũ tráo", "ngũ tráo", "nigod", "nigot", "niguti", "nika", "nike", "nikka", "nil-nika", "nirgandi", "nirgiri", "nirgud", "nirgudi", "nirgudi", "nirgund", "nirgunda", "nirgundi", "nirgur", "nirguri", "nir-nochchi", "nishinda", "nishunda", "nisinda", "nochchi", "nochi", "pasutia", "pôn-kiuⁿ-á", "po-kiuⁿ", "ran-gura", "samalu", "sambhalu", "sandbhalu", "sewain", "shawalu", "shiwa", "shiwai", "shiwáli", "shriwari", "simali", "simalu", "sinduari", "šivlingi", "siwáli", "sooddoo-nikka-gass", "sudu-nika", "Taiwan-ninzinboku", "trâsek", "trasiet", "vallai-nochchi", "vavili", "ven-nochi", "vennochchi" [applied also to *Capparis zeylanica* L.], "yellow bramble", and "zuugora". Pharmaceutically it is known as "Folia vitex negundo", "Fructus Vitex negundo", and "Radix Vitex negundo".

Mallik & Chaudhuri (1968) describe the pollen of this species as "3-colpate grains, prolate, 24 μ -- 28 μ x 16 μ -- 18 μ , exine 2 μ thick, reticulate, exine thick at poles. gradually thinning towards mesocolpium, sexine thicker than nexine, colpi 19 μ in length, crassimarginate, apocolpium diameter 7 μ ." Huang (1972) describes it as "Grains prolate to subprolate; 27--32 x 20--24 μ ; amb circular-lobate" on the basis of Mori 22447 from Taiwan. Serbanescu-Jitarin & Mitroiu (1973) describe it as: "Polen prolat; 3-colpat; văzut apical 20,8--28,6 μ in diam., din profil înalt 20,8--46,8 μ , lat 15,6--28,6 μ . Scuturat din antere și văzut cu ochiul liber, polenul este galben-portocaliu, în apă la microscop, portocaliu, iar în chloral-hidrat galben-pal. Caracterele sporodermei sînt în general aceleași ca la polenul de *V. agnus castus*, dar suprafața sporodermei prezintă un aspect areolat datorită distribuirii veruculiilor așa cum se observă la *V. altissima* (Nair -- 1962). Colpi cca 4/5 din raza microsporilor, înguști și foarte ascuți spre poli."

It is worth noting that the Roxburgh (1814) reference given in bibliography of this species (above) is often cited by the titlepage date "1813", but Stafleu asserts that it was not published until 1814 along with the earlier part of the work. The Schnitzlein (1856) reference is often cited as "1843--1870", again the titlepage date, but the actual page involved here was issued in 1856. Buek (1858). in the index to his work, cites *Vitex negundo* Roxb. to p. 684, but I am unable to find the name on that page of the work. The Haines (1922) reference is sometimes cited to 1. 6, 1924, but the pages here involved are in vol. 4, published in 1922. The Willis (1911) reference is sometimes cited as "3: 357", but I have not been able to verify any such reference.

Prasad & Wahi (1970) discuss the macro- and microscopic characters of the whole leaf (petiole, petiolule, midrib, and lamina). The palisade cells of the lamina and cortical cells of the midrib were found to contain volatile oils and tannins. An alcoholic extract of the leaf revealed the presence of alkaloids and glycosides. Kondanda Rao and his associates (1977) found the bark to yield a fatty alcohol, beta-sitosterol, vanillic acid, p-hydroxybenzoic acid, and luteolin, and an indication of flavonoid C-glycosides.

Vohora and his associates (1974) report that an ethanolic extract from the seeds, given as an oral dose of 200 mg/kg for two days, inhibited copper acetate induced ovulation in rabbits in 60% of the animals tested.

Two new leucoanthocyanidins were isolated by Subramanian and his associates (1978) from the stem bark, their structure being that of methyl ethers of leucodelphinidin and leucocyanidin-7-O-rhamnoglucosides respectively.

Ray & Majumdar (1976) report no antimicrobial activity in the plant (exclusive of its roots). Gibbs (1974) reports the presence of vitexin, vitexin-4-L-rhamnoside, and vitexin-?-xyloside in the species and/or its varieties. Datta (1950), Madan & Nayar (1959), Sarma (1963), and Mahli & Trivedi (1972) also report that the roots and bark yield alkaloids, mishindine, a volatile

oil, and glycosides which are bitter and poisonous. The presence of an-alkaloid and a volatile oil in the leaf is reported by Basu & Singh in their 1944 and 1947 works; nishindine and a volatile oil in their 1947 work. Itikawa & Yamasita (1940) report the presence of cineole, 1-sabinene, 1-a-pinene, camphene, a monohydric terpene alcohol, b-caryophyllene, a tricyclic sesquiterpene like copaene, another sesquiterpene, azulene, and a diterpene in volatile oil; Ghose & Krishna (1936) report the presence of gluconitol, p-hydroxybenzoic, 5-hydroxyisophalic, and 3,4-dihydroxybenzoic acids, and a glucoside in the leaf. Greshoff & Boorsma are reported by Heyne (1917) to have found "in den bast en da bladeren een chromogeen glucosied en.....een spoor alcaloïd."

Vitex negundo is reported to be "medicinal" by Madrid Moreno (1936), while Smith noted already in 1871 that it is "extensively used in India in native medicinal practice". My wife and I observed it frequently grown in native gardens as an ever-ready source of medicine in Sri Lanka.

In India it is asserted by Shah & Joshi (1971) that "The leaves, heated in earthen pots, are used as a fomentation in rheumatism and body swellings. A decoction, mixed with pepper, is taken for colds." Shrivastava & Sisodia (1970) report that aqueous extracts of the fruits were found to have good analgesic effects which were not antagonized by nalophine and resemble antipyretic analgesics.

Srivastava (1976) reports that in Gorak the species is "Planted in gardens as a hedge plant, also on bunds along the fields and roads. The warmed leaves are applied to rheumatic swellings and on the forehead in headache."

Patel (1971) avers that in Gujarat it "Grows in nallas and river beds. The paste of leaves is applied to skin sores. The flowers are used as medicine on [sic] diathoea, cholera and lever [sic] disorders." In his 1968 work he reports the "roots and leaves used in medicine and the young shoots....used for making baskets" in Melghat. Jain & Terafder (1970) list its medicinal uses in Bihar as for headaches, swelling of the head, eye inflammation, dropsy, anasarca, madness, rheumatism, hemiplegia, epilepsy, post-natal complaints, scabies, syphilis, sores, and rinderpest. Guhabakshi & Naskar (1969) tell us that in this same Indian state it is commonly used as a hedge plant. They cite *Guha Bakshi* 79.

Hyland (1969) lists *Vitex negundo* as cultivated in Maryland, citing nos. 308641, 264815 (from India), and 267709 (from Hong Kong). Coon (1967) asserts that it is taller and hardier than *V. agnus-castus* L. "and should be more widely cultivated". Bailey (1972) says that it is grown "especially for attracting bees". Brooker & Cooper (1961) reports its use for "many medicinal purposes" in Indonesia.

Cooke (1905) calls the species "A common shrub throughout the [Bombay] Presidency often cultivated in gardens and for hedges.... The leaves are agreeably aromatic when bruised and are employed in native medicine. A pillow stuffed with the leaves is placed under

the head to relieve headache. The leaves are also employed as a remedy in inflammatory swellings of the joints." He reports the plant very common along the banks of rivers and in moist situations in or near deciduous forests, abundantly planted. Burkill (1966) describes it as "A small bush, sometimes attaining 15 feet in height, but in the Malay Peninsula, apparently, always smaller, found from Africa to the Pacific; in the [Malay] Peninsula it is found in the north, and in Singapore, where perhaps it is introduced. It is similar to *V. trifolia* and used medicinally in various parts of Asia, but, as far as known, it is not used by the Malays as much as *V. trifolia*. In India and China it has a greater importance. In India the roots and leaves are regarded as a tonic and febrifuge. A decoction of the leaves, or their juice, aids in the composition of draughts for head-ache, catarrh, &c., and a pillow of the leaves may be used for head-ache....In China the fruits are much used. The Chinese in the Malay Peninsula import the dried fruits from China for use in their own prescriptions.....Rumpf recorded that roots and leaves were medicinal in his time in Amboina.....Both this species and *V. trifolia* are held in high repute in the Philippine Islands for fomentations for rheumatism, beri-beri, &c."

Maheshwari (1963) states that in Delhi *V. negundo* is "Planted in gardens, lawns and along railway lines. Common on the Bangar tract on raised bunds along the roads. The warmed leaves are applied to painful and rheumatic swellings; the macerated ones are used as cooling medicine on the forehead in headache." He cites Maheshwari 118 & 689. Kumar (1974) reports from Mussoorie that it is there used in curing headaches, catarrh, fever, and for removing fetid discharges and worms from ulcers and is planted "to cover small gullies and check dams". Smiley (1960) avers that it can be used as a trimmed hedge both in direct sunlight or in semi-shade. Jafri & Ghafoor, in a personal communication to me, state that it is often planted along water channels to check erosion in Pakistan and grows readily from cuttings. There, too, "Its leaves are sometimes used for curing inflammatory swellings of joints, headache etc." They give its overall distribution as "Pakistan, India, E. Asia and N. Africa; introduced and widely cultivated elsewhere. They cite Abedin 7701, Abedin & Qaiser 8646, Ali, Faruqi, & Abedin 1957, 1958, 1959, & 1962, Ghafoor & Qaiser 297, Jafri 3845, Jafri & Ali 3493, Nasir & Ali 4573, Qaiser & Ghafoor 119i, 297, 1573, 2003, & 4495, Saida s.n., and Siddiqui & Nasir 6554, all from Pakistan.

Naine (1894) says: "This is probably the commonest shrub in the Konkan. Very common also in the Ghats. Throughout India... The crushed leaves have a very strong and unpleasant smell, said to be equally so to insects." Troup (1921) calls it "very common, and often gregarious, throughout the greater part of India, extending into dry regions and ascending to 5,000 feet in the outer Himalaya. Abundant in open waste places, and as a hedge plant along roads and between fields. It is a useful plant for afforestation work, producing root-suckers and growing readily from cuttings. It is not usually browsed. The twigs are useful

for wattle-work and rough basket-work. Growth.....7 rings per inch of radius, giving a mean annual girth increment of 0.9 in."

Williams (1949) reports that on the islands of Zanzibar, Pemba, and Panza it is found "growing wild by the seacoast....the leaves said to have some medicinal value.....the soft and light wood used for laths, roofs, planks, canoe outriggers and guitars."

Rageau (1957) says that in New Caledonia it is "un arbuste des régions côtières qui passe également pour répulsif pour les insectes. Les feuilles, l'écorce et les racines sont employées contre les maux de dents, les fièvres, le rhumatisme, les ophthalmies et comme toniques, carminatives et vermifuges. Les feuilles sèches sont parfois fumées pour calmer les céphalalgies et les migraines tenaces. La racine et les fruits seraient emménagogues."

Kanjilal & al. (1939) assert that in Assam it is common throughout the country and the strongly scented twigs are used for basket-making, the leaves and roots as a tonic and febrifuge. Pattnaik (1956) notes that in Orissa the roots and leaves are used as a tonic and febrifuge and a decoction of the leaves serves in the treatment of headache and catarrh.. Deb (1968) reports that in Tripura the roots and leaves are used medicinally and the plant is "cultivated to make domestic compounds". Sharma (1975) reports that in Bengal it is cultivated as hedges around fields. Abraham and his associates (1974) asserts that *V. negundo* ranks second in effectiveness in insecticide properties against the Anguimoid grain moth, *Sitotroga cerealella* Oliv., in stored paddy in Kerala.

Van Melle (1943) points out that, as with *V. agnus-castus*, the total effect [of *V. negundo*] "of the foliage is grayish, the leaves having a gray-woolly hairiness on the lower surface....the leaves are highly aromatic. They are effective, but rather exotic-looking and erect shrubs, not easily blended in the border and perhaps better used by way of garden accent plants or 'cut-back' garden hedge-rows. They flower at a time [in the U.S.A.] when there is not much else in bloom among the shrubs and, in the better, lavender-blue forms, contribute a worth-while decorative note to the small landscape. They thrive well in light, sandy soils, in full sun. Being coarse-rooted and difficult to dig with a ball of earth, they are best transplanted bare-rooted, in the spring. When they are treated as die-backs, the tenderness of the top-growth need not worry one. The roots are hardy enough; and should an occasional plant be lost in severe winters, these shrubs are worth planting again."

Steinmetz (1957) gives its distribution as "Ceylon, India, Burma, Indonesia, Australia, Northern China", reporting as present in the leaves an essential oil and a resin, in the fruit acids, resin, and coloring matter. He enumerates the uses of the leaves as an alterative, anodyne, bitter tonic, aromatic, febrifuge, discutient, and antiparasitic; of the roots as a tonic, expectorant, febrifuge, and diuretic; of the fresh fruit as a nervine, emmenagogue, and cephalic; and of the dried fruit as a vermifuge and to reduce an enlarged spleen.

Parker (1924) encountered it in "the Sub-Himalayan tract [of Pun-

jab] ascending to 4,000 feet from the Indus eastwards. Also Trans-Indus. Common. Often gregarious in small patches on the banks of streams and similar places. Grows readily from cuttings, and is often planted in hedges by natives. Young leafy shoots, planted nearly horizontally in the rains, appear to root better than older wood. The plant is likely to be useful for afforestation works, but not in very dry places."

Hansford (1957) records the fungus, *Asteridiella depokensis* Hansf., as parasitic on *Vitex negundo* in Java, based on "BO.2344". In his 1961 work he records *Irenopsis aciculosa* var. *viticis* (Rehm.) Stev. from the Philippines, based on Baker 1515. Bedi (1967) asserts that *Alectra parasitica* var. *chitrakutensis*, an alkaloid-containing scrophulariaceous plant traditionally used in the treatment of leprosy and other ailments, is often found growing on the roots of "white-flowering *Vitex negundo* in certain limited areas of India."

Tilak & Kale (1968) found the fungus, *Massaria kamatii*, on the dead stems of *Vitex negundo* in India, while in their 1969 work they report similar dead stems infested by the ascomycetes, *Gymnema montanum* Hook. and *Ophioceras petrakii* Tilak & Kale. In their 1970 paper they report another ascomycete, *Ostropa indica* (*O. idia*), also on dead stems; in their 1971 paper they add *Myttilidion kamatii*. Tendulkar (1972) reports *Diatrype viticis* from *Vitex negundo* in India. Livingstone (1976) lists the heteropterous insect, *Dasytingis rudis* Drake & Poor (*Tingidae*) as a sap-sucker on the *Vitex negundo* of India.

Puri (1960) reports that the leaves of this plant were tested for antibiotic properties and proved negative in respect to *Staphylococcus aureus*, *S. albus*, *Bacillus subtilis*, *Escherichia coli communis*, *Elerthella typhosae*, *Vibrio cholerae*, and *Klebsiella pneumoniae* and only partially inhibited the growth of *Shigella dysenteriae*.

Worthington (1959) claims that in Sri Lanka this species is often planted as a hedge, for ornament, or for medicinal purposes [all of which claims my wife and I verified while we were in that country], and that the leaves laid on stored grain act as an insect deterrent. Woodrow (1910) asserts that it "Is a useful and elegant fence plant [in the tropics] for a district with heavy rainfall and 2,000 feet altitude". Prain (1903) records it from Chota Nagpur, Bihar, Tirhut, north Bengal, and the Sundribunds. Collett (1902) lists it from the valleys below Simla, where it blooms from March to June, and asserts also that it occurs "Throughout India, ascending to 5000 ft." as well as in "Nearly all tropical regions".

Pételot (1953) summarizes the medicinal properties as follows: "L'espèce est connue des populations vietnamiennes, qui emploient ses feuilles, de saveur amère, un peu nauséuses, contre les rhumatismes et les fièvres intermittentes, elles sont aussi utilisées en bains contre le bérubéri, l'hémiplégie et la paralysie; parfois, elles sont fumées contre les céphalalgies. Enfin, elles sont préparées en décoction contre les coliques persistentes, dans les cas aigus de hémorragie (pissement de sang) et contre les enflures du corps."

"On se sert des racines comme fébrifuge en décoction à la dose de 30 g. de racines concassées pour un litre d'eau....Les fruits, préparés en décoction, sont ordonnés dans le cas de règles difficiles, les racines également de la même manière contre les maux de tête et pour faciliter les transpirationes.

"D'après Poilane....les feuilles froissées, très odorantes, sont utilisées au Centre-Vietnam contre les douleurs. A cet effet, avec les feuilles, on compose un lit sur lequel on se couche.

"Tavera....parlant à la fois des *V. Negundo* et *V. trifolia* dit que les deux espèces, dont les pouvoirs thérapeutiques sont identiques, jouissent d'une grande réputation aux Philippines.

"Bontius appela l'attention sur le *Vitex* disant que ses feuilles sont diurétiques et emménagogues.

Les feuilles, chauffées au feu et appliquées en grande quantité sur les articulations atteintes par les rhumatismes, sont très employées dans l'Union indienne, de même que dans l'Archipel malais. La décoction de ces feuilles s'emploie en bains guérir le béribéri, de même que des bains de vapeur de cette décoction. On met une grande quantité de feuilles dans une marmite, autant que celle-ci en peut contenir sans les comprimer toutefois, puis on verse de l'eau et on pose sur le feu jusqu'à ébullition. On met le malade déshabillé sur un siège, en le couvrant d'une couverture de coton, puis d'une couverture de laine; ensuite, on met la marmite sous le siège en la retirant de temps à autre, jusqu'à provoquer une sudation abondante.

"Flemming....regarde les feuilles comme le meilleur résolutif contre les rhumatismes. Les indigènes les chauffent dans un pot de terre jusqu'à ce qu'elles puissent être supportées sans douleurs, les appliquent sur les parties douloureuses et les maintiennent en place à l'aide d'un bandage. On répète ces opérations trois ou quatre fois par jour.

"Dans l'Union indienne et aux Philippines, il existe une maladie caractérisée par une douleur intense localisée dans la plante des pieds et dont on ne connaît pas autre chose que le nom de 'brûlure de pieds', que les indigènes ont lui donne. Trois ou quatre applications de *Vitex* guérissent admirablement ces douleurs...Pour cela, on met les feuilles dans une marmite sans eau sur le feu et, lorsqu'elles sont très chaudes, on les applique sur la plante des pieds du malade en les maintenant bien au moyen d'une bande.

"Le Dr. W. Ingledew dit que les indigènes du Mysore se servent en bains de vapeur de la décoction des *Vitex* pour guérir les rhumatismes et les affections catarrhales fébriles. La décoction de ces feuilles est très employée aux Philippines, dans l'Archipel malais et dans l'Union indienne pour les bains des femmes à l'état puerpéral. Les feuilles sèches se fument pour guérir les maux de tête et les catarrhes.

"Selon le témoignage de certaines personnes, l'application de feuilles chauffées selon description ci-dessus, a donné de très bons résultats dans le traitement des orchites.

"La racine est tonique, fébrifuge et expectorante et le fruit emménagogue, selon les auteurs sanscrits.

"En Chine, les graines préparées en décoction servent contre les rhumatismes et les maladies nerveuses. On leur accorde les vertus

de consolider les dents, de réduire les maux de tête, les maux d'yeux et d'oreilles."

Hohenacker, on the label of a herbarium sheet, reports that the pulverized roots, cooked with rice, are spread as an application over leprous sores.

Various authors have supplied information regarding the natural distribution of the species in areas with which they were acquainted. Stewart (1972) lists it for "Trans Indus and the Indus eastward, ascending to 4000' in the Sub-Himalayan zone". Patel (1968) describes it as common throughout Melghat. Fosberg and his associates (1975) refer to it as "an infrequent Indo-Pacific plant in clumps" near the coast of Maug and Pagan islands. Van-katareddi (1969) found it "fairly common in open areas", while Singh (1969) calls it a denizen of "waste places". Cherian & Pataskar (1969) describe it as "common on hill slopes; Kaushik (1969) reports it "abundant in the basin of the Sindh river" in Madhya Pradesh; Vajravelu and his associates (1968) found it "very common" in Kerala, while Raju (1966) lists it from Andhra Pradesh.

Rechinger (1967) gives its overall distribution as northwest Pakistan, India, Sri Lanka, China, Japan, Taiwan, Hong Kong, Hainan, the Philippines, Java, Sarawak, east Africa, and Madagascar. He cites the nomenclatural type as "Herb. Linn. gen. 811 (790) no. 8". Blackburn (1952) limits its natural distribution (sens. strict.) to southern and southwestern China and India. This is probably the most correct, although its extension into Pakistan, Burma, and Sri Lanka is probably also original. Thwaites & Hooker (1861) report it common on the banks of rivers and streams up to an elevation of 3,000 feet in Sri Lanka.

Fournet (1978) reports it only cultivated in Guadeloups and Martinique, while Voigt (1845) found it in cultivation in Calcutta. Fletcher (1938) found it growing among limestone rocks and in village clearings, as well as cultivated in temple gardens in Thailand, giving its extended range as "E. Africa, India (type), Ceylon, French Indochina, Philippines, Hainan, China, Japan, and w. Polynesia" [this, of course, like so many of the overall distributions given by authors, obviously includes the quite separate ranges of the subspecific taxa (varieties and forms, and most probably also the range of *V. trifolia*, a species with which it is very often and consistently confused].

Gupta (1971) found *Vitex negundo* abundant in the tropical pine forests of Himachal Pradesh, commenting that "the leaves contain an essential oil". Kartawinata (1965) encountered it in the "fringes of the *Sophora tomentosa* association in Peutjang, near Java. Shah (1969), as well as Inamdar (1968, 1971), report it from Gujarat, while Sebastine & Ellis (1967) describe it as "very common near roads and pathways through dry evergreen vegetation with *Clerodendrum inerme* and *Ficus benghalensis*" in the Madras region, citing *Sebastine 10613*. Vajravelu & Rathakrishnan (1967) also refer to it as "very common" in Madras, citing their *no. 20613*. Misra (1970) refers to it as a "weed" in Bihar. Esfan-diari (1967) lists it from Baluchistan and Iran, citing unnumbered

collections by Alexandrov, Mirazayan, Rechinger, Rechinger, Esfandiari, & Allen, Safavi, and Scharf. Yamazaki (1966) lists it from 700--2000 m. in the eastern Himalayas, giving its overall distribution as "Afghanistan, Himalaya, India, Burma, Indo-China, and Malaya".

Monsalud & al. (1966) assert that the seeds are boiled and eaten in the Philippines and that the plant "Occurs in interior valleys and along seacoasts throughout the country". Merrill (1918) notes that "*Vitex negundo* Linn. is common and widely distributed in the Philippines at low and medium altitudes, perhaps introduced. Blanco's *Vitex leucoxylon* is, in part only, referable here." Fernandez-Villar (1880) reports it very common ["vulgatissima"] at Manila and adds that he saw live plants of this species in Luzon, Mindanao, Panay, and Cebu. Ahern's collector call it "a small shrub common in dry thickets, etc., throughout the Philippines". Wilson (1929) describes it as "the commonest shrub in the ancient kingdom of Pa [China]". Parsa (1949) lists it from Baluchistan, commenting that "cette espèce, originaire du nord de la Chine, est très rustique; sa floraison a lieu en Juillet."

Chiovenda (1916) lists it from the former Italian Somaliland. Osmaston (1927) tells us that in Kamoon it "Occurs throughout the area up to 4,500 feet. Common, especially bordering large streams, in dry river beds or in open miscellaneous forests of the Bhabar. It sometimes forms small gregarious patches," flowering from March to August. Patunkar (1980) reports that it is "with *Lantana aculeata*, among the dominant shrubs of small disturbed forests on the Deccan Plateau in Maharashtra State, growing along with *Annona squamosa*, *Acacia chundra*, *A. leucophloea*, *A. torta*, *Canthium parviflorum*, *Capparis brevispina*, *C. zeylanica*, *C. decidua*, etc."

Puri (1960) reports that in Coorg this species grows in sandalwood forests and that "in tropical moist deciduous forests of teak in pure mineralized soil which is colonized by xerophyllous species especially adapted for growing in pure sand there appear in descending order of frequency the first colonizers -- *Saccharum* sp., *Tamarix dioica*, then *Vitex negundo*, followed by *Acacia catechu* and then *Zizyphus oenoplia*." Banerji (1966) found it abundant in Nepal.

Dale & Greenway (1961) refer to *Vitex negundo* as a strand plant in Kenya, citing Jeffery 348. Hsiao (1978) reports that in Taiwan it is "common at low altitudes from north to south", giving its overall distribution as "Tropical East Africa to Asia and Polynesia", citing from Taiwan Henry 905, Nakazawa s.n., Tanaka 97, and Wilson 10972. Hallier (1918) cites the following collections: Java: Boerlage 463, Junghuhn 46. Sarawak: Haviland & Hose 1645E & 3552. Luzon: Hallier 4055, McGregor 5259, Merrill 3627, Ramos 8292, Rosenbluth & Tamesis 12708, and Vidal 1648. Banda: Reinwardt s.n. Mauritius: Sieber II.161. Thailand: Zimmermann 2.

Dunn & Tutchter (1912) list it from Hong Kong, New Territory, and Lantau Island. Trimen (1895) says that in Sri Lanka it inhabits "Low country, borders of streams, especially in the dry region, common; also much grown in native gardens. Fl[owers] all

the year; bright lilac-blue. Throughout India, Afghanistan, Eastern Asia, and the Philippine Is. There is no specimen or drawing in Herb. Hermann. Leaves sweetly aromatic when bruised. They are much used in native medicine as a fomentation in rheumatism; the root is also employed as a tonic." Gürke (1895) lists it from the Mascarene Islands, stating that it occurs there "Stets in der Nähe des Meeresstrandes".

Recent collectors describe *Vitex negundo*, in its typical form, as a large, erect, woody shrub, sometimes "semi-scandent", or a small tree or treelet, forming dense colonies, 3--10 m. tall, branching, aromatic, the branches wide-spreading or drooping, the leaves gray-tomentose beneath when fresh, the flower-buds pale-lavender, ill-smelling, the flowers sparse, not showy, the calyx pubescent, and the upper lip of the corolla 2-lobed, the lower lip 3-lobed with the middle lobe extra large.

The flowers [corollas] are described as "bluish" [Dey & al., 1969], "bluish or purplish-white" [Patel, 1968], "blue-purple" [Gupta, 1967], "bluish-purple" [Puri & al., 1964; Matthews, 1970], "blue or purple" [Banerji, 1966], "blue" [Suwal, 1969], "light purplish" [Hsiao, 1978], "purplish" [Alston, 1931], "purple" [Makins, 1936], "lavender" [Dunn & Tutcher, 1914; Fletcher, 1972], "violet" [Datta & Majumdar, 1966], "lavender-blue" [Baker, 1900], "lilac or lavender" [Baileys, 1976], "lilac-blue" [Worthington, 1959; Dale & Greenway, 1961], "bright lilac-blue" [Trimen, 1895], and "pale to deep blue with a yellow horseshoe mark" [Corner & Watanabe, 1969].

Collectors describe the corolla color as follows: "blue" on Abedin & Qaiser 8646, Banerjee & al. 3532, Ingod & Pancha 201, Pancho 1184, Qaiser & Ghafoor 297, 1191, 1593, 2003, & 4495, Qaiser, Raza, & Hussain 1054, "bluish" on Taam 1728, 'pale-blue' on Rajab 2, "light-blue" on Stevens 411, "purplish-blue" on Waas & Tirvengadam 810, "blue-purple" on Fosberg 56392, "purplish" on Moldenke & al. 28260, "purple" on Ali, Farooqi, & Abedin 1957, 1958, 1959, & 1962, Qureshu s.n. [13.11.1966 & 20.11.1966], and Saldanha 16393, "lavender" on Hu 5607 & 10675 and Moldenke & al. 28337, "violet" on Abedin 7701, Qaiser 209 & 222, "light-blue, middle lower lobe with yellow & purple patches" on Hu 8311, "light-purple within with a white spot on lower lip" on Moldenke & al. 28210, "lilac, petals recurved" on Comanor 778, "violet, top of lower lip white" on Davidse 7345, "bright lilac-blue" on Amaratunga 1180 & 1362, and "light bringel color" on Qaiser & Ghafoor 7701.

Collectors have found the plant growing in lateritic soil, in sandy loam, and in clay loam with gravel and stones, along fence-rows, on hillsides, in waste ground, secondary forests, and bamboo thicket along rivers, along roadsides, and on moist foothills and open grassy hillslopes. Pancho reports it "occasional in thickets [on Luzon] but common and widely distributed in the Philippine Islands, flowering all year, common in lower elevations, sometimes used as an insect repellent because of the odor of the leaves when crushed, powdered, or burned".

Taam found it to be abundant on dry level sandy ground among

scattered shrubs on Lantau Island. Saldanha refers to it as a common small tree in Mysore, but Banerjee & al. refer to it as "rare" in Nepal. Koelz encountered it at the borders of field in the deserts of Iran; Hu calls it a "common shrub" in Hong Kong. Davidse found it growing along the forested margins of rock outcrops in secondarily shrubby areas in Sri Lanka, while Worthington collected it on the same island in "an area of 90 inches rainfall".

The number of leaflets per leaf appears to vary considerably: on Sivarajan CU.1848 the number was consistently 5, on Sieber Fl. Maurit. 8 it is 4; on Moldenke 28260 it is all 3. On Moldenke 28210 all the leaflets are 3 in number or a few are 5 with the central one petiolulate; on Moldenke 28266 the leaflets are all 3 and all petiolate or the smaller leaves have the 2 basal leaflets sessile; on Moldenke 28212 the leaves all have only 3 leaflets, the central one largest, the 2 side ones unequally petiolulate. On Moldenke 28147 & 28260 the leaflets are all 3 in number and all are petiolulate (the central leaflet with the longest petiole on 28260); on Moldenke 28337 the leaflets are all 5 in number, of which only the 3 central ones are petiolulate; on Moldenke 28332 the leaflets are all 3 in number with only the central one petiolulate, or else are mostly 3 in number with 2 leaves bearing 5 leaflets. Qureshi s.n. [13.11.1966] has the middle 3 of 5 leaflets 5--15 cm. in length! Extra long petiolules are seen on Abedin & Qaiser 8646, Qaiser 222, and Qaiser & Ghafoor 2003 & 7701.

Pollen has been collected for study from Comanor 778. Rechinger 30985, in general appearance, looks very much like the wide-leafleted forms of *Vitex agnus-castus* var. *pseudo-negundo* Hausskn., with which it may well be a natural hybrid.

Recent collectors have found the plant in flower from March to August and in fruit from June to February. Authors give various flowering periods for the species for their particular regions: in Melghat it is said to bloom from June to December, in Delhi for the "major part of the year", in Sri Lanka "all year", and in Pakistan also "around the year". In Assam it is reported to fruit "in the cold season" and this applies also to the Melghat region; in Tripura it fruits "in winter". In Gorek it is said to flower and fruit for the "major part of the year" and in Gujarat it is also described as flowering and fruiting "practically throughout the year"; in Madhya Pradesh it flowers "after the rains". In cultivation in England it blossoms in "late summer or early autumn". Recent collectors have encountered it from sealevel to 2300 m. altitude.

Nisa & Qadir (1969) describe the seeds and their germination: "seed dormancy is due to the hard impermeable testa" which requires scraping with sandpaper, soaking in water, or treatment with sulfuric acid to be softened. The seeds are exalbuminous, hard, white, rough, ovoid, with vertical ridges present, a micropyle and hilum present; there are 2 cotyledons. The average weight of the seed is .045 gm. and its average diameter is 7 mm. Hypogeal germination was observed.

Sharma & Mukhophyay (1963) report the chromosome number as 34,

while Sobti & Singh report it as 26 and Malik (1963) as $2n = 24$ -- the differences probably attributable to misidentification of the specimens used, misidentification of herbarium material (and of living material) of this species and related species being as widespread as it is.

Madan & Nayar (1959) describe in detail the macroscopic and microscopic characters of the leaves and roots. Browne (1756) describes a *Vitex* from Jamaica as "Arboreus, foliis ovatis, crenatis, quinato-digitatis; petiolis communibus oppositis, racemis laxis alaribus.....This tree is frequent in St. Mary's, and grows generally to a very considerable size: it is easily distinguished by its crenated leaves, bunchy flowers, long berries, and the variegated under lip of its blossoms; the main division of which, is of the figure of a heart. The style is bifid, and each part pretty short." This plant he regarded as Linnaeus' *Vitex negundo*, but is it? The description, however, does not fit *V. umbrosa* Sw. either, nor *V. divaricata* Sw., the only two species of the genus known from the island.

Clarke (1885) includes *Vitex bicolor* Willd. and *V. arborea* Desf. in the synonymy of *V. negundo* L., but the former is now known as *V. trifolia* var. *bicolor* (Willd.) Mold. and the latter is *V. negundo* f. *albiflora* Mold. He gives the overall distribution of species as "Throughout India and Ceylon, in the warmer zone a universal plant.....Distrib. Cabul, E. Asia to the Philippines. A shrub or small tree hardly distinguishable from *V. trifolia* but by the points mentioned in the diagnosis [leaves 3--5-foliolate, leaflets petiolulate, lanceolate, entire or crenate, glabrate above, the under surface and the panicles closely white-tomentose, corolla 1/4 to 1/3 inch long, drupes 1/5 inch long, black]. The leaflets are frequently 5, the centre one at least usually distinctly petioluled, the flowers rather smaller." Obviously this is a description of *V. trifolia* var. *bicolor* in large part.

Merrill (1917), speaking of *C. B. Robinson 305* from Amboina, says: "The specimen, as Doctor Robinson notes, shows every intergradation between what is called *Vitex trifolia* Linn. and *V. negundo* Linn., a character that is also presented by many herbarium specimens sometimes placed under one name, sometimes under the other. It is strongly suspected that the two species, at least as currently interpreted, are really not distinct. The reduction of *Lagondium litoreum* Rumph. to *Vitex negundo* Linn. was made by Linnaeus, in Stickman Herb. Amb. (1754) 15, Amoen. Acad. 4 (1759) 126, Syst. ed. 10 (1759) 1122, which disposition of it has been accepted by practically all authors. Lamarck, Encycl. 2 (1788) 612, placed it under his *Vitex paniculata*, but *Vitex paniculata* Lam. is a synonym of *Vitex negundo* Linn. The 'species' has the range of *Vitex trifolia* Linn.

"*Lagondium nigrum* Rumph., extensively treated by Rumphius, Herb. Amb. 3: 52, and supposed to grow in Buru Island, is probably purely an imaginary plant. Regarding it, Hasskarl, Neue Schlüssel (1866) 75, states: 'fabula, nec arboris descriptio enerratur; arbor ex hac fabula intelligi haud potest.'"

Dietrich (1843), following Raeuschel (1797), uses the name, *Vitex negundo* for the eastern Indian population of this species, with the

leaflets "oblongo-lanceolatis subserratis subtus argenteo-lanatis" and *V. spicata* for the Chinese population with the leaflets "lanceolatis subcrenatis subtus tomentosis". The "*V. negundo*" illustrated by Alexander (1971) actually represents its var. *cannabifolia* (Sieb. & Zucc.) Hand.-Mazz.

Several recent authors have proposed keys for distinguishing *Vitex negundo* from closely related species or for separating its infraspecific taxa. For instance, Townsend (1972):

1. Lower lip of the corolla glabrous or with only a few sparse hairs at the basal angles.....*V. agnus-castus*.
- 1a. Lower lip of the corolla bearded with a semicircular line of hairs at the base.
 2. Inflorescence with the lateral cymes more congested; inner surface of the calyx with the intermediate veins zigzag above or tending to merge into the reticulate secondary venation, extending from the middle of the tube upwards; petiolule of central leaflet to 1 cm. long.....*V. agnus-castus* var. *pseudo-negundo*.
 - 2a. Inflorescence with the lateral cymes lax; inner surface of the calyx with the intermediate veins straight and almost reaching the sinuses, the secondary venation at most looping-anastomosing and never reticulate in the tube; petiolule of central leaflet to 2 cm. long.....*V. negundo*.

Patel (1971) gives the following:

1. Leaves 3- or 5-foliolate; leaflets petiolulate, lanceolate....*V. negundo*
- 1a. Leaves 3-foliolate or simple; leaflets sessile, ovate-oblong.*V. trifolia*.
- Petzat & Rechinger (1967), on the basis of Iranian material:
 1. Leaflets mostly in 3's or less; cymes very lax....*V. trifolia*.
 - 1a. Leaflets more numerous; cymes mostly dense.
 2. Flowers mostly in simple inflorescences or panicles; cymes sessile or subsessile; leaflets mostly 5--7.
 3. Lower corolla-lip not barbate within....*V. agnus-castus*.
 - 3a. Lower corolla-lip barbate within.....*V. agnus-castus* var. *pseudo-negundo*.
 - 2a. Flowers mostly laxly paniculate; cymes plainly stipitate; leaflets mostly 3--5.....*V. negundo*.

Backer & Bakhuizen (1965) retain *V. paniculata* Lam. as separate from *V. negundo*, applying it to what we call *V. trifolia* var. *bicolor* (Willd.) Mold. Liu (1962) includes in typical *V. negundo* not only *V. paniculata* Lam. and *V. leucoxydon* Blanco, but also such disparate taxa as *V. bicolor* Willd. and *V. cannabifolia* Sieb. & Zucc.

Dunn & Tutcher (1912) use the following differentiation:

1. Calyx truncate, denticulate.....*V. trifolia*.
- 1a. Calyx acutely dentate or lobed.....*V. negundo*.
- Alston (1931), using Sri Lankan material:
 1. Leaflets 3, elliptic-lanceolate, stalked or not...*V. trifolia*.
 - 1a. Leaflets 5, lanceolate, stalked.....*V. negundo*.

Prain (1903), using African material:

1. Leaflets 3 or 1, sessile, obovate or obovate-oblong, entire...
.....*V. trifolia*.

- 1a. Leaflets 3 or 5, petiolulate, lanceolate, entire or rarely crenate.....*V. negundo*

Trimen (1895), using Sri Lankan material:

1. Leaflets oblong-oval, obtuse.....*V. trifolia*.
- 1a. Leaflets linear-lanceolate, acute.....*V. negundo*.

Jafri & Ghafoor (pers. comm.), using Pakistan material:

1. Leaflets (1)--3; cymes lax, calyx 4--5 mm. long...*V. trifolia*.
- 1a. Leaflets (3)--5--7; cymes slightly lax to dense; calyx 2--3 mm. long.

2. Leaflets 3--5; cymes often somewhat lax and paniced, forming a pyramidal inflorescence; flowers not fragrant.....
V. negundo.

- 2a. Leaflets 5--7; cymes sessile or subsessile, forming a sub-cylindric narrow inflorescence; flowers fragrant.

3. Lower corolla-lobe glabrous or slightly pubescent at the base only.....*V. agnus-castus*.

- 3a. Lower corolla-lobe densely ciliate or pubescent.....
V. agnus-castus var. *pseudo-negundo*.

Kuntze (1891) offers a very interesting subspecific key:

1. Foliola 5--7 media subsessilia vel petiolulata.....
V. agnus-castus ♂ *typica*.

- 1a. Foliola 3--5 in eadem stirpe.

2. Foliola omnia sessilia, 1: 1 1/2 -- 4.....
V. agnus-castus β *trifolia*.

- 2a. Folia media 1--3 petiolulata.

3. Foliola 1: 2 1/2 -- 4.....*V. agnus-castus* γ *negundo*.

- 3a. Foliola 1: 5--8.....*V. agnus-castus* δ *negundodes*.

- 3b. Foliola 1: 1--2.....*V. agnus-castus* ε *javanica*.

- 1b. Foliola 1--3.

4. Folia plurima ternata; foliola 1: 2.....
V. agnus-castus ζ *subtrisecta*.

- 4a. Folia plurima vel omnia simplicia; foliola 1: 1 -- 1 1/2..
V. agnus-castus η *ovata*.

He comments that "Schauer, Bth. etc. ziehen mit Recht die ostasiatische *V. ovata* Thbg. zu *trifolia*, ebenso S. Kurz diese zur mediterranen *V. Agnus-castus* (=♂ *typica*); Kurz lässt noch *V. Negundo*, die Clarke richtig als hardly distinguishable von *V. trifolia* beziehn, nur durch die gestielten Mittelblättchen abgesondert, aber das ändert bei ♂ *typica* ebenfalls. Ich sammelte 2 weitere Mittelformen. Sonstige Unterschiede existieren nicht."

Various authors have cited material which they considered to represent typical *Vitex trifolia*. Diels (1902), for instance, cites GL.1370 & 1372, Niederlein 115, and Rosthorn s.n. from central China. Baker (1900) cites Hildebrandt 1254 from Tanzania, noting "Also in tropical Asia and Madagascar". Williams (1905) cites Zimmermann 2 from Thailand, while Fletcher (1938) lists Curtis s.n., Kerr 3657, 4286, & 16627, Lakshnakara 664, Marcan 263, Wilkinson 20799, and Zimmermann 2 from the same country. Diels (1913) cites Forrest 1096 from China, while Lam (1919) lists

Berhout 440 from Banka, Teijsmann 16728 from Billiton, Hance 951 from Whampoa, and Zimmermann 442 from China.

Fedde & Schuster (1941) cite Boerlage 483 and Junghuhn 46 from Java, Haviland & Hose 1645 & 3552 from Borneo, and Darling 16562, McGregor 5259, Merrill 3627 and Ramos 8292 from the Philippines, but include *V. incisa* Lam. in the synonymy.

From India there are many citations recorded in literature, of which the following are some: Puri and his associates (1964) cite Blatter & Hall s.n. and Jain 40159 & 40164; Joseph & Vajravelu (1967) cite their no. 13521; Rao & Kumari (1907) no. 20082; Vyas (1967) nos. 255 & 409; Billore & Hemadri (1969) no. 115608; Cherian & Pataskar (1969) Rolla 109325 & 111153; Singh (1969) nos. 25412, 25539, & 33512; Venkatareddi (1969) nos. 93216 & 95773; Malhotra & Moorthy (1971) nos. 118757, 123378, 123567, & 134962. Ellis & al. (1967) cite no. 18696 from Kerala; Vajravelu & al. (1968) cite Joseph 17107 from the same state. Tiwari (1968) refers to his no. BXXXV.1115 from Madhya Pradesh, and from the same state - Saxena (1970) Khotele 6863 and Saxena & Khotele 5880, and Saxena (1971) Saxena & Pandey 83395 & 83555, as well as Saxena & Khotele (1976) Khotele 9387. Thakar & al. (1970) cite B.5018 from Gujarat. Srivastava (1976) lists his no. 502 from Gorak.

Patzak & Rechinger (1967) cite Koelz 14219 from Iran and Cleg-horn 2638, Hatt s.n., Koelz 4137, Rechinger 19617 & 30985, and Stewart 17067 from Pakistan. Hartley and his associates (1973) cite their nos. 10466 & 10870 from Huon Gulf, while Fosberg & al. (1975) list Falanruw 2246 from Maug island and Falanruw 1858 and Moore 423 from Pagan island.

Cooke (1905) cites from Bombay Dalzell s.n. and Talbot s.n., from Konkan Woodrow s.n., from Deccan Cooke s.n., and from Sind Cooke s.n. He gives the species' overall distribution as "Throughout India; Ceylon, Afghanistan, Philippine Islands".

Karavaev (1976) cites a Rheede Expedition (1674--1675) specimen from Malabar in the Moscow University herbarium - doubtless the type of Rheede's *Bem-nosi*.

Many herbarium collections, in various herbaria, have been mis-identified as typical *Vitex negundo* L., but are something different. Among these may be mentioned the following:

Moran 2458 is *Vitex agnus-castus* L.

Ali 5 & 1074, Andersen & Petersen 443, Iman 32, Long 4D, Qaisar 209, Qaiser & Ghafoor 1525, and Rechinger 19617 & 30985 are *Vitex agnus-castus* var. *pseudo-negundo* Hausskn.

Elmer 5611, Merrill 3627, and Pancho 285 are *Vitex elmeri* Mold.

Cheng 3366, Chin 843, En 2810, Hu 10244, Poore 296, G. Thomson s.n. [Maisor & Carnatic], T. Thomson s.n. [Punjab, 1-4000 ped.], and Wan & Chow 79016 are *Vitex negundo* var. *cannabifolia* (Sieb. & Zucc.) Hand.-Mazz.

Rowell 5801 is *Vitex negundo* var. *heterophylla* (Franch.) Rehd.

Chiao 22343, Hu 6858 9243, Kapoor & Thamann 27194, Koelz 8278, Liang 63036, and Wroten C.423 are *Vitex negundo* var. *intermedia* (P'ei) Mold.

Elmer 8125, Herb. Hort. Bogor. XV.J.A.XXXIV.6, Koorders 42133b, Merrill 1503, 1636, 2320, & 3429, Merrill Sp. Blanc. 440, and Teijs-

mann 16728 are *Vitex negundo* var. *philippinensis* Mold.

Fortune 25 is *Vitex negundo* f. *purpurascens* Sivarajan & Mold.

Keng & al. K.6223 is *Vitex siamica* F. N. Will.

Comanor 778, Tanner RT.2960, and T. Thomson s.n. [Punjab, 1-4000 ped.] are *Vitex trifolia* L.

Ahern 166, 223, 255, 671 [71], & 814 [28], Balgooy 2305, Baumann-Bodenheim 5176, Bloembergen 4788, Borden s.n. Herb. Philip. Forest Bur. 2035], Brass 21928 & 28095, Burgess 40403, Cailipan s.n. [Herb. Philip. Forest. Bur. 25637], W. W. Clark s.n. [Herb. Philip. Forest. Bur. 2527], Cockburn 68408, Elmer 11999, Fosberg 56425, Lütjeharms 4655, Meier SAN.58806, R. Meyer s.n. [Herb. Philip. Forest. Bur. 2276], Riley 52, Robinson 305, J. V. Santos 5258, Stone 10962, Sumithrarachchi & Jayasuriya DBS.232, Tan s.n. [SAR.28818], Tanner 2960, Whitford 853, and R. S. Williams 185 & 2978 are *Vitex trifolia* var. *bicolor* (Willd.) Mold.

Addru 173 is *Vitex trifolia* var. *bicolor* f. *albiflora* (Kuntze) Mold.

Soepadmo KLU.9116 and Soepadmo & Mahmud 9173 are *Vitex trifolia* var. *simplicifolia* Cham.

Soepadmo KLU.9173 is *Vitex trifolia* var. *simplicifolia* f. *albiflora* (Y. Matsumura) Mold.

Alsterlund 9, Elmer 7877, and Shah MS.1212 are *Vitex trifolia* var. *subtrisecta* (Kuntze) Mold.

Gillespie 2953 & 4164 are not *Vitex* -- their leaves are lepidote; they have the aspect of *Petraeovitex*.

Shrestha 1748 is a species of *Buddleia*

Sieber Fl. Maurit. II.161 is not verbenaceous and Nigan s.n. is probably not verbenaceous.

Additional citations: LOUISIANA: Richland Par.: P. White 175 (Ne--82898). St. Mary Par.: Dooley 488 (Ne--70904). OKLAHOMA: Marshall Co.: Duff 59 (Tu--129548). MASCARENE ISLANDS: Mauritius: Sieber Fl. Maurit. 84 (E--116186, Mu--665). IRAN: Koelz 14219 (W--2194244). PAKISTAN: Baluchistan: Ali, Farooqi, & Abedin 1957 (Kh), 1958 (Kh), 1959 (Kh), 1962 (Kh); Ghafoor & Qaiser 297 (Kh, Kh, Kh); Qaiser 209 (Kh); Qaiser & Ghafoor 1191 (Kh), 1593 (Kh); Qaiser, Raza, & Hussain 1054 (Kh). Northwestern States: Abedin 7701 (Kh); Abedin & Qaiser 8646 (Kh, Kh); Qaiser & Ghafoor 2003 (Kh, Kh), 7701 (Kh). Sind: Ahlotar s.n. [26.10.1958] (Kh). West Punjab: Qaiser & Ghafoor 4495 (Kh). NEPAL: Banerjee, Upadhyay, & Baskala 3532 (W--2581505). INDIA: Assam: Chatterjee s.n. [April 1902] (Pd); Jenkins s.n. [Assam] (Mu--661); Masters s.n. [Assam] (Mu--662, Pd). Karnataka: Saldanha 16393 (W--2653610); W. D. Stevens 411 (Ln--232295). Kerala: Hohenacker 160 (Mu--663); Silcarajan 42 (Uc), 142 (Ld), CU.1848 (Ac); Stocks, Law, & c. s.n. [Malabar, Concan] (Pd). Sikkim: Prain's Collector s.n. [18/5/1903] (Pd). Uttar Pradesh: Dimri 79 (Pd); Kunar 79 (Pd). West Bengal: T. Thomson s.n. [1-4000 ped.] (Pd); Thomson & Hooker s.n. [Plan. Ganget. Inf.] (Mu--657, Pd). State undetermined: Bojer s.n. [ex India orient.] (Mu--690); Collector undetermined s.n. [Lamber, 7th June 1802] (Pd); Griffith s.n. [India orientali] (Mu--638); Hügel s.n. (Mu--659, Mu--660); Quilon 766/1830 (Pd); Wight 2324 (Mu--1351, Pd). MALDIVES ISLANDS: Dunnika: Ibidi 123 (Pd).

Malé: *Christopher s.n.* [1888] (Pd). Turadu: *Gardiner s.n.* [1899-00] (Pd). Vermiandu: *Gardiner s.n.* (Pd). SRI LANKA: *Amaratunga* 1180 (Pd), 1362 (Pd); *Burman* 60 (M, Mu--664); *Comanor* 778 (Ac); *Davidse* 7345 (Ld, W--2803434); *F. R. Fosberg* 56392 (N, W--2811452); *Gardner s.n.* [Thwaites C.P.1956; Jaffna] (Pd); *Moldenke, Moldenke, & Jayasuriya* 28212 (Ac, Gz, Kh, Ld, Pd, Tu, W); *Thwaites C.P.* 1956 [Peradeniya] (Pd); *Waas & Tirvengadam* 810 (Ld, W--2806291); *Worthington* 184 (K), 6378 (K). CHINA: Kwangtung: *Chow & al.* 78054 (N, W--2895176). CHINESE COASTAL ISLANDS: Lantau: *Taam* 1728 (Ba, N). HONG KONG: *Hu* 5607 (W--2711383), 8311 (W--2711252), 10675 (W--2732107). MALAYSIA: Selangor: *Kasim bin Rajab* 2 (K1--1002). TAIWAN: *Hsu & Kao* 3400(S); *Tanaka & Shimada* 17878 (Mu). PHILIPPINE ISLANDS: Luzon: *Ahern's Collector* 102 (Mi, W--1584133); *Cas-tillo s.n.* [Herb. Philip. Bur. Sci. 22747] (W--897948); *Elmer* 5611 (W--852861), 18119 (Mi, W--1237575); *F. C. Gates* 6187 (Ws); *Ingod & Pancho* 201 (Ba); *Loher* 4432 (Mu--3965, W--446878), 4433 (W--446879), 6531 (Mu--4215); *Mangubat s.n.* [Herb. Philip. Bur. Sci. 1343] (W--439798); *E. D. Merrill* 147 (W--435146), 1503 (W--436461), 1636 (W--436590), 2320 (W--437268), 2876 (W--437846), 2917 (W--437887), 3429 (W--438411), 3627 (W--438490), *Sp. Blanc.* 440 (W--904117); *Otanés s.n.* [Herb. Philip. Bur. Sci. 17995] (W--898105); *J. V. Pancho* 1112 (Ba), 1184 (Ba); *Quisumbing s.n.* [Philip. Nat. Herb. 18826] (W--2214859); *Wilkes s.n.* [near Manila] (W--40648). CULTIVATED: California: *McCaskill* 346 (Se--166705, Tu--118723). India: *Herb. Hort. Bot. Calcut. s.n.* (Pd); *Wallich* 1744/2 (Pd). Java: *Herb. Hort. Bot. Jav. s.n.* (Pd). Louisiana: *Hamlin s.n.* [4-16-72] (Ne--65026); *P. White s.n.* [3 July 1969] (Ne--33943). North Carolina: *Pratt s.n.* [October 7, 1964] (Lv). Pakistan: *Hu-sain s.n.* [12.10.1957] (Kh); *Qaiser* 222 (Kh, Kh); *Qureshi s.n.* [20.11.1965] (Kh, Kh), *s.n.* [13.11.1966] (Kh, Kh). Sri Lanka: *Moldenke, Moldenke, Dassanayake, & Jayasuriya* 28332 (Ld, Pd, W--2764538), 28337 (Gz, Pd, W--2764547); *Moldenke, Moldenke, & Jayasuriya* 28147 (Pd, W--2764410), 28210 (Ac, Gz, Kh, Ld, Pd, Tu, W--2764471); *Moldenke, Moldenke, & Silva* 28260 (Pd, W--2764526); *Moldenke, Moldenke, Jayasuriya, & Sumithraarachchi* 28266 (Ac, E, Gz, Kh, Ld, Pd, Tu, W--2764505); *Worthington* 1976 (K).

VITEX NEGUNDO f. *ALBA* P'ei

Additional bibliography: Hocking, *Excerpt. Bot. A.* 12: 570. 1968; *Mold.*, *Phytologia* 17: 15--17. 1968; *Mold.*, *Fifth Summ.* 1: 291 (1971) and 2: 927. 1971; *Mold.*, *Phytol. Mem.* 2: 280 & 592. 1980.

VITEX NEGUNDO f. *ALBIFLORA* Mold.

Additional bibliography: Moon, *Cat. Indig. Exot. Pl. Ceyl.* 46. 1824; *Buek, Gen. Spec. Syn. Candoll.* 3: 501. 1858; *Pételot, Pl. Méd. Camb. Laos Vietn.* 2: 248 (1954) and 4: 171. 1974; *Bedi, Econ. Bot.* 21: 277, 279, & 281. 1967; *Bedi, Hortic. Abstr.* 38: 517. 1968; *Mold.*, *Phytologia* 17: 17, 22, & 23. 1968; *Mold.*, *Résumé Suppl.* 16: 13 & 29. 1968; *Mold.*, *Fifth Summ.* 1: 374 (1971) and 2: 713 & 927. 1971; *Mold.*, *Biol. Abstr.* 50: 418. 1969; *Mold.*, *Phytologia* 44: 391 (1979) and 45: 491. 1980; *Mold.*, *Phytol. Mem.*

2: 367 & 592. 1980.

Moon (1824) seems to refer to this white-flowered form as occurring in Sri Lanka, listing the vernacular name, "sudu-nika", for it there. Bedi (1967, 1968) asserts that *Alectra parasitica* var. *chitrakutensis* grows as a parasite on the roots of "white-flowering *Vitex negundo*" in certain limited areas of India. It is an alkaloid-producing plant traditionally used in the treatment of leprosy.

VITEX NEGUNDO var. *CANNABIFOLIA* (Sieb. & Zucc.) Hand.-Mazz.

Additional synonymy: *Vitex negundo castaneaefolia* Everett, Cat. Hardy Trees Shrubs 120. 1942.

Additional bibliography: Swa-wi [transl. Savatier], Arbor. 4: pl. 1. 1759; Benth. in Benth. & Hook., Gen. Pl. 2 (2): 1154. 1876; C. B. Clarke in Hook. f., Fl. Brit. India 4: 584. 1885; Sakaguchi, Gen. Ind. Fl. Okin. 18-19. 1924; Stapf, Ind. Lond. 6: 478. 1931; Everett, Cat. Hardy Trees Shrubs 120. 1942; Hara, Enum. Spermat. Jap., imp. 1, 1: 190. 1948; H. N. & A. L. Mold., Pl. Life 2: 69. 1948; Hatta, Kubo, & Watanabe, List Med. Pl. 15. 1952; Naito, Sci. Rep. Kag. 2: 60. 1953; Masamune, Sci. Rep. Kanazawa Univ. 4 [Enum. Trach. 7]: 48. 1955; Roi, Trait. Pl. Méd. Chin. 411 & 484. 1955; Liu, Illustr. Nat. Introd. Lign. Pl. Taiwan 2: 1229, fig. 1037. 1962; Hyland, U. S. Dept. Agr. Pl. Invent. 168: 7. 1967; Mold., Phytologia 17: 15 & 17--20. 1968; Mold., Résumé Suppl. 16: 29. 1968; D. R. W. Alexander, Hong Kong Shrubs 105. 1971; Mold., Fifth Summ. 1: 134, 208, 270, 279, 291, 293, 294, 298, 311, 328, & 374 (1971) and 2: 660, 714, 715, 721, 723, 724, & 927. 1971; Priszter, Delect. Sem. Spor. Pl. Hort. Bot. Univ. Hung. 59. 1971; Hara, Enum. Spermat. Jap., imp. 2, 1: 190. 1972; Kooiman, Act. Bot. Neerl. 24: 462. 1975; Mold., Phytologia 31: 389 (1975) and 34: 266. 1976; E. H. Walker, Fl. Okin. South. Ryuk. 894. 1976; C.-W. Li, China Recunst. 27 (2): 4. 1978; Li, Nan-fang 100--102 & 168, fig. 29. 1979; Mold., Phytologia 45: 485. 1980; Mold., Phytol. Mem. 2: 126, 198, 258, 266, 280, 282, 283, 287, 298, 302, 303, 319, 367, & 592. 1980; Hu, Enum. Chin. Mat. Med. 45 & 219. 1981.

Additional illustrations: D. R. W. Alexander, Hong Kong Shrubs 105 (in color). 1971; Li, Nan-fang 102, fig. 30. 1979.

Recent collectors describe this plant as a low shrub, 1--2.3 m. tall, often gregarious, suckering from the base, the flowers sweet-scented, and the immature fruit green. They have found it growing on grassy hillsides and slopes, at the edges of forests, on dry land, along roadsides, and in dry, rocky, and grassy places in general, but, according to Chin, "NOT on limestone", at 50--220 m. altitude, in anthesis in March, May, July to October, and December, and in fruit in July. Tsiang refers to it as "common" in Kweichow.

The corollas are said to have been "pale-blue" on Chin 843 and Poore 296, "lavender-blue" on Hu 10244, "mauve" on Rhodes 47-64-1222, and "greenish" on Tsiang 8518.

The leaf-margins on what appears to be the type collection, an unnumbered Siebold collection, are remarkable for their fine appressed teeth. In most other collections the teeth are larger

and more erect.

Walker (1976) notes that this variety is reported by Masamune (1955) from Ishigaki and Iriomote islands, but that "This has not been verified". Hyland (1967) reports it cultivated in Maryland, citing *U. S. Dept. Agr. Pl. Invent.* 262787 from Japan. Masamune (1955) regards the "*V. negundo* L." of Sakaguchi (1924) and of Naito (1953) to be var. *cannabifolia* rather than the typical form of the species. He records the variety also from Taiwan, the Philippines, Hainan, Fukien, Honan, Kiangsu, Anhwei, Chekiang, Hupeh, Szechuan, Kwangtung, Yunnan, Malaya, Madagascar, and "Africa", but it seems obvious that he is here referring to the species as a whole. The Rhodes collection, cited below, was taken from a plant grown in Canada from seed secured from Portugal. Priszter (1971) offers seeds to horticulturists as his no. 1674.

Vernacular names reported for the variety are "hem-leaved vitex", "hoang king", "huang-ching-taü", "merboh", "mou-ching", "sizo king", "taiwan-ninzinboku", and "tch'ou king li". Hu (1981) reports that the plant appears in Chinese materia medica under the trade name of "*Fructus Viticis Cannabifoliae*".

It should be noted that the illustration given by Liu (1962) as representing var. *cannabifolia* actually represents typical *Vitex negundo* L. The Schneider (1911) reference in the bibliography (above) is sometimes cited as "1912", but appears actually to have been published in 1911. The Benthams (1876) reference is usually cited as "Bentham & Hooker", but, as painstakingly recorded by Bentham himself ["On the joint and separate work of the authors of Bentham and Hooker's *Genera Plantarum*" in *Journ. Linn. Soc. Lond. Bot.* 20: 304--308. 1883], the section on *Verbenaceae* was authored by Bentham alone.

Roi (1955) lists this plant as among the medicinal plants of China. Li (1978, 1979) asserts that it is "a common plant widely distributed in northern [and] central to southern China. The leaves are palmately compound, generally with five leaflets below and three toward the top of the stem. The use of *Vitex* for witchcraft is.....mentioned in the much later work of Wu Ch'i-chün who says that 'There is a kind of ching in Kiangsi. Near the root there are three leaflets, above that four, five, six, and seven leaflets successively. The natives there said those with wholly seven leaflets can be used to control demons and ghosts'. This passage is probably referring to some morphogenetic variations of the very common species *Vitex negundo* L. and its varieties. Those variations, to the ancients or uninitiated, may have seemed to signify magical powers. It also shows that the superstitions pertaining to *Vitex* mentioned by Chi Han persisted in some parts of southern China to at least the nineteenth century. The use of the Mou-ching as a magical plant seems to have originated in the north but it had special significance in the south. In the *Han-shu*.... it says that Mou-ching was used as designs to depict the sun, moon, and stars on pennants for religious ceremonies initiating the conquest of Nan-yüeh. The commentary of Chin Chu says that the inter-joints [internodes] of Mou-ching are not equal, and that it is cut, when the moon has a halo, into a sign to scare sick people.

This statement is significantly similar to the description of Mou-ching in Ning-p'u as given by Chi Han and by P'ei Yüan.

"*Vitex cannabifolia*.....[is a] medicinal herb widely used for cough and asthma in the southern provinces of Kiangsu and Chekiang." Chemical analysis shows the presence of volatile oils containing 17 elements effective in the treatment of and prevention of bronchitis. Oil extracted from the leaves is made into capsules and an emulsion and the "Results are better than with herbal brews. It readily reduces or eliminates patients' symptoms. Inflammatory epithelial lesions of bronchus mucosa improve markedly." He asserts that this plant is opening up "vast resources for a medicine that can be collected and processed locally" and which is now the "leading drug in preventing and treating chronic bronchitis in China" -- also helpful in reducing incidence of pulmonary emphysemas and pulmonary heart disease."

Alexander (1971) reports the plant "Very common in Hong Kong, growing in thickets on hillslopes at lower level. Seeds, roots and leaves are of medicinal value. Young shoots are useful for weaving baskets."

The late O. F. Cook, writing from San Antonio, Texas, in a typescript dated April 10 and September 23, 24, 26, and 27, 1911, and very kindly made available to me by my good friend and colleague, Dr. Velma Rudd, gives a very interesting description, with illustrations, of anisophylly in this variety: "Leaves opposite, decussate, but each alternate pair unequal, the leaf on the upper or inner side being smaller than the others. This remains true regardless of actual exposure, showing that the inequality is determined in advance of actual conditions of growth, though it may depend upon position in the axil next to the main stalk, which may be unfavorable. The inequality is greatest at the base of the shoot, becoming gradually less.

"It would be of interest to determine whether the inequality is one of size only, which might be judged by comparison of shapes of leaves of equal pairs with those of unequal pairs.

"Effect on inflorescences. The inflorescences that terminate the branches are supplemented by lateral inflorescences from the axils of the upper leaves. If these represent an equal pair two supplemental inflorescences are produced, while if the last pair is unequal there is only one supplemental inflorescence, from the axil of the larger leaf. As the small leaf that fails to produce an inflorescence branch is on the upper side and the large leaf on the lower two-branched inflorescences usually have a vertical position, one branch above another[sic].

"Inequality of floral bracts. Anisophylly does not cease with the foliage leaves, but may be shown very distinctly in the long, narrowly linear bracts that subtend the branches of the inflorescence. The bracts that subtend lateral branches are nearly equal, while those of superior branches are shorter than those of inferior branches. The bracts are often deeply bifid and sometimes split completely to the base, so as to appear double. This tendency to division may be considered as a reflection or translocation of characters from the inflorescence branches which are pseudo-dichotomous in the

lower joints, by the regular abortion of the terminal buds and the development of two subterminal. The distal portions of the inflorescence branches become sympodial, for on joints that are to produce fruit only one subterminal bud develops.



Fig. 1. Leaves showing the plan of having each alternating pair unequal

"Leaves of unequal pairs are more symmetrical than those of equal pairs. The phenomenon of anisophylly is not confined to the upper and lower rows of leaves, but is frequently reflected in differences between the upper and lower halves of the lateral or equally-paired leaves. Indeed, it is a general rule that the leaves of equal pairs are less symmetrical than those of unequal pairs. Inequalities between the two halves of the lateral leaves are most apparent on branches where the anisophylla of the upper and lower leaves is most pronounced. The most frequent and obvious form of inequality is that of the basal lobes which are often much larger on the ventral side of the leaf than on the dorsal. Or there may be an additional lobe on the ventral side of the leaf not represented on the dorsal side.

"In addition to the differences of the basal division the other divisions of the lower side of the leaf are usually larger than those of the upper side, though they may be less deeply lobed. Indeed, the larger of the inferior divisions often exceeds the median division in size.

"Anisophylly is a term used to indicate a condition of inequality of leaf development on the upper and lower sides of specialized lateral branches.

"Some plants have all the branches alike, at least in the form and arrangement of leaves, while other plants produce two or more kinds of branches, sometimes with definitely different kinds of leaves. Plants that have the lateral branches different from the upright branches are likely to show the phenomenon of anisophylly. One of the most frequent specializations of lateral branches is that of producing only two rows of leaves, one on each side, as in coffee and in the Central American rubber tree (*Castilla*). In such cases the leaves of the lateral branches are equal. The phenomenon of anisophylly appears on plants that have the lateral branches somewhat specialized, but with more than two rows of leaves.

"Though not at all confined to opposite-leaved plants, the condition of anisophylly is much more readily recognized and more readily studied on such plants than on those that have less definite arrangements of leaves. When the leaves that grow out at the same time and from the same place on the same branch are regularly unequal some definite factor of development must be involved. To observe the workings of this factor and, if possible, to connect it with other external conditions or internal factors of heredity is a matter of scientific interest.

"This plant affords several unusual advantages for the study of anisophylly. In addition to the opposite leaves, the square stems and decussate arrangement make it very easy to follow the different rows of leaves, and the highly specialized, palmately divided form of the leaves makes it possible to institute several comparisons and to secure by simple inspection much more definite results than could be obtained from simple-leaved plants without resorting to elaborate measurements.

"Differences of form in leaves of the same pair. If the inequality of the leaves of the same pair were limited to differences of

size alone there would appear to be more reason in ascribing the inequality merely to differences of position, exposure or nutrition, and less reason to look upon the inequality as a definite



Fig. 2

hereditary specialization. But when the forms of the leaves that belong to the same dorso-ventral pairs are observed it soon becomes evident that the inequality has been provided for very far back in the development of the shoot, when the original plans or primordia (Anlagen) of the leaves were laid down. The differences



Fig. 3

are not merely matters of size but often represent quite profound differences of form. The lobes are not only differently cut, but often differ in number, the usual figures being five in the upper leaf and seven in the lower. Some will be seen where the middle lobe is deeply cut -- or the basal divisions may be lobed in the small leaf, entire in the large.



Fig. 4. Showing irregular notching in opposite pairs of leaves



Fig. 5. Showing differences in alternating pairs of leaves

"Inequality not lost with change of position. On lower horizontal or drooping branches the relations of the leaves and exposure to light are often completely changed. If a branch grows in a horizontal instead of an obliquely ascending direction the equal pairs of leaves stand above and below the branch, while the unequal pairs take the lateral positions along the sides. If the inequalities of size and form depended directly on gravitation or exposure to light they should be seriously modified by these changes in the position of the developing branches, but in reality no such changes appear. Unequal pairs though growing in lateral positions show as pronounced inequalities as when growing in vertical positions...."

[to be continued]

BOOK REVIEWS

Alma L. Moldenke

"A REVISED HANDBOOK TO THE FLORA OF CEYLON" Volume II edited by . M. D. Dassanayake & F. R. Fosberg, viii & 511 pp., 171 line draw. pl., published for the Smithsonian Institution, the National Science Foundation and the University of Peradeniya, Sri Lanka, by the Amerind Publishing Company Pvt., New Delhi. "Available from the U. S. Department of Commerce, National Technical Information Service, Springfield, Virginia 22161". 1981. \$25.00.

A few issues earlier the first volume with ten families was welcomed as bringing up-to-date Trimen's classical work (1893-1900), Alston's emendations and corrections (1931), and the recent U. S. funded field and herbarium research by specialists. About two-thirds of this volume are devoted to the 68 genera in the *Orchidaceae* and *Apostasia wallichii* split off into its own family by D. M. A. Jayaweera. There are excellent line-drawn habitat and dissected flower and fruit illustrations without which identifications would be particularly difficult even though the keys and descriptions are well prepared. The other families also treated in this volume are: *Bignoniaceae* by Theobald, *Lemnaceae* by Hepper, *Myrtaceae* by Ashton, *Pittosporaceae* by Tirvengadam, *Primulaceae* by Sommer, *Proteaceae* and *Thymelaeaceae* by Townsend and *Rhizophoraceae* by the recently deceased Macnae and completed by Fosberg.

"HAWAII A NATURAL HISTORY - Geology, Climate, Native Flora and Fauna Above the Shoreline" Second Edition by Sherwin Carlquist, x & 468 pp., 53 color photos, 1000 b/w photos, 38 line draw, 2 tab. & 15 maps. Pacific Tropical Botanical Garden, Honolulu, Hawaii. 1980. \$18.00 paperbound.

The first edition was published a decade earlier for the American Museum of Natural History. This one is much enriched with many more of the author's fine illustrations which "present much information in a condensed fashion and are useful for identification and browsing.....and for explorations of the significance of native features." The main sections of the book consider (1) the Hawaiian setting in terms of its geology and climate, (2) such biological phenomena as dispersal, adaptive radiation, arborescence, loss of flight in birds and insects, and dispersal in plants, (3) development of special groups such as the land snails, honeycreepers, lobelioids and silverswords, (4) biological regions of the main islands and the leeward chain, and (5) field trips and references. This is an attractive, intelligent souvenir of Hawaiian nature.

"ANNUAL REVIEW OF PLANT PHYSIOLOGY" Volume 32, edited by Winslow R. Briggs with Paul B. Green & Russell L. Jones, xi & 641 pp., 21 b/w fig., 1 draw., 7 tab. & 3 photo. Annual Reviews Inc., Palo Alto, California 94306. 1981. \$20.00 U.S.A., \$21.00 foreign.

In the introductory paper, "Biochemical Mechanisms of Disease Resistance", A. A. Bell emphasizes that "resistance depends on many biochemical components," that "elimination of a single component may weaken but will not necessarily destroy resistance" because it is a "multicomponent dynamic system, paying particular attention to time sequences and cellular specialization." The eighteen other well presented valuable papers are grouped under Molecules & Metabolism, Organelles & Cells, and Tissues, Organs, & Whole Plants. What a valuable collection of annually pertinent research topics have been presented in these volumes since 1949! Their easy availability as reprints as well as their full bibliographies and thorough indexing make their contents readily accessible for germinating, budding and full bloom plant scientists. The prefatory chapter is prepared by Dr. Birgit Vannesland, Norwegian-born, Chicago-educated as a biochemist (enzymes) and now at the Max-Planck-Gesellschaft in Berlin. "The scientists aren't taking the mystery out of life. Even if they wanted to, they couldn't do it."

"A PLANT CLASSIFICATION" Second Edition by Lyman Benson, xxiv & 901 pp., 211 b/w photo, 290 line draw., 22 fig., 17 tab. & 16 maps. D. C. Heath and Company, Toronto and Lexington, Massachusetts 02173. 1979. \$22.95.

The first edition of 1957 was and still is a wonderful text, but with the passage of more than two decades several basic concepts in this taxonomic and/or systematic field have changed and are incorporated into this also wonderful, mature edition. It is very well presented and illustrated copiously with excellent photographs and line drawings of flower dissections showing family key characters by the recently deceased J. D. Laudermilk. Keying goes this far before switching to local floras for anywhere in the United States and Canada. The author presents the four following major groups of dicots: (1) *Thalamiflorae* (hypogynous, choripetalous or apetalous), (2) *Corolliflorae* (also hypogynous but sympetalous), (3) *Calyciflorae* (perigynous or epigynous, choripetalous or apetalous) and (4) *Ovariflorae* (epigynous and sympetalous). The end page repeats them with diagram, key and text page reference for efficient keying to families. The book is well worth its price. I find myself stimulated to think of several different ways to use this text as the major one in a course on plant classification. The last chapter on floral associations is so well presented and illustrated that I hope it is not truncated because of limited class time.

"THE BLUE LIGHT SYNDROME" edited by H. Senger, xvi & 432 pp., 432 b/w fig., 18 photo & 69 tab. Springer-Verlag, Berlin, Heidelberg & New York 10010, N. Y. 1980. \$49.80.

This book includes all the papers presented at the "International Conference on the Effect of Blue Light in Plants and Microorganisms" and also a few papers by those who could not attend the sessions in the Philipps-Universität, Marburg. Now these first broad coverages of the relatively new field can be shared with more than the 140 attending scientists from 18 countries. "The largest amount of time was dedicated to the photoreceptor problem, but the attempt to decide between flavins or carotenoids failed". Among some of the 60 papers are such topics as: evolution of photosensory systems, bacteriorhodopsin, blue-light induced intracellular movements, blue and near U-V reversible photoreaction in fungal conidia, photokilling in *Fusarium*, blue-light effects on enzymes in carbohydrate metabolism and on greening in microalgae.

"SEXUAL SELECTION AND REPRODUCTIVE COMPETITION IN INSECTS" edited by Murray S. & Nancy A. Blum, xi & 463 pp., 59 b/w fig., 27 tab., 20 photo & 24 draw. Academic Press, London, San Francisco, New York, N. Y. 10003. 1979. \$29.50.

This book is composed of thirteen expanded and updated, neatly typed and offset-reproduced papers presented to the Behavior Section of the 15th International Congress of Entomology in Washington, D. C., in 1976. They address "the role of individual fitness in reproductive success as a primary prerequisite to comprehending sexual selection. In so doing, the authors demonstrate that reproductive competition has many evolutionary faces. Their message is perfectly clear -- only when these faces are analyzed and their significance understood can we hope to comprehend the subtleties of sexual selection." Approaching this goal with data from the field, the lab, and systems analyses are some papers on the historical development of sexual selection theory, sexual selection and mating strategies, and also sexual conflict, functions of beetle horns, *Achias*' eyestalks, and the survival value of courtship in insects.

"A DICTIONARY OF BOTANY" by R. John Little & C. Eugene Jones, iv & 400 pp., 159 b/w line draw. & fig. Van Nostrand Reinhold Company, Dallas, San Francisco, New York, N. Y. 10020. 1980. \$18.50.

About 5,500 simple, direct, modern definitions from all fields of botany are presented. Less used and differently used terms in several of the long existing older dictionaries have been either dropped, lumped or modified. The illustrations are clear, helpful and listed in cross reference where they can be useful for

more than one term. This book should be made available to all botany and horticulture students especially beginning serious ones. It is not meant to be a substitute for the previous older English, French, German and Latin botanical dictionaries of much greater detail and less availability.

"WESTCOTT'S PLANT DISEASE HANDBOOK" Fourth Edition revised by R. Kenneth Horst, xx & 803 pp., 43 color photo, 48 b/w photo & 51 draw. Van Nostrand Reinhold, Dallas, San Francisco, New York, N. Y. 10020. 1979. \$32.50.

This new edition maintains the excellence of content treatment and familiar format, and therefore keeps this book prime in its field among several other excellent ones because the reviser Horst "always had great respect professionally for Dr. Cynthia Westcott". Not with clerical "rubber stamping", but with his own professional skill, Dr. Horst did what Dr. Westcott would have done but was no longer available to do. "Chemicals and pesticide regulations have been updated; a few taxonomic changes have been made in the bacteria, fungi, and mistletoes; the changing picture in diseases caused by viruses and/or viruslike agents has been described; a few new host plants have been added; and many recently reported diseases as well as previously known diseases listed now on new hosts have been included. In addition photographs have been replaced where possible, and some color photographs have also been added." And they are all excellent. "This book should be useful to gardeners, landscape architects, florists, nurserymen, seed and fungicide dealers, pesticide applicators, arborists, cooperative extension agents and specialists, plant pathologists, and consultants." Surely he did not mean to omit schools of horticulture and agriculture.

"PROGRESS IN BOTANY -- Morphology, Physiology, Genetics, Taxonomy, Geobotany" Volume 42 or "FORTSCHRITTE DER BOTANIK - Morphologie, Physiologie, Genetik, Systematik, Geobotanik" edited by Heinz Ellenberger et al., xiv & 418 pp., 18 fig. & 4 tab.. Springer-Verlag, Berlin, Heidelberg, New York, N. Y. 10010. 1980. \$56.00.

For each of the above topics there are such carefully prepared current papers in English or German (but without summaries in the alternate language) as (1) morphogenesis of the prokaryotic cell and of eukaryotic algal cells, (2) biosynthesis of plant glycoproteins and alkaloids, (3) replication, recombination and insertion mitogenesis, (4) phylogeny of bacteria and lower plant groups, (5) Quaternary vegetation, experimental ecology and mycorrhizal symbiosis. The 27 papers are well documented with references.

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